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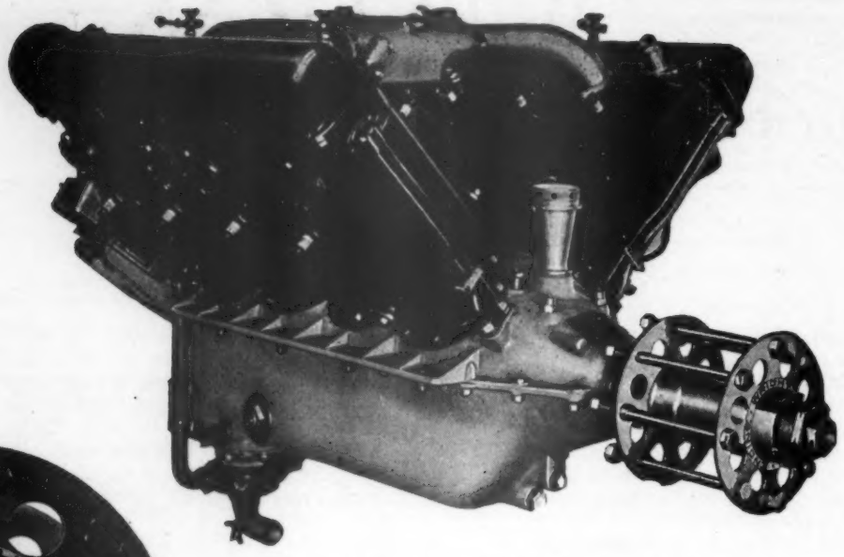
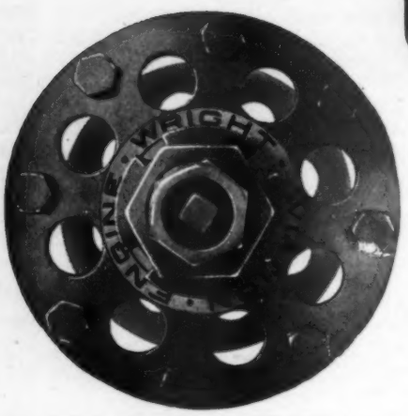
THOMAS-MORSE AIRCRAFT CORPORATION

Thomas-Morse Training 2-Seater in flight over Ithaca, N. Y.

THOMAS-MORSE AIRCRAFT CORPORATION





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AVIATION AND AIRCRAFT JOURNAL

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Commercial Aviation

COMMERCIAL aviation in this country is not succeeding, obviously because "they can't get the passengers". The reasons for this are also clear enough. Although it is hard to say which are the most serious of these items, the following list as a whole can hardly be questioned as to its deterring effect:

1. High rates.
2. High risk.
3. Irregularity.
4. Discomfort.
5. Time required to get to and from terminals.
6. Impracticability of night trips.

All the above are inter-related. Items (1) and (2) make an especially bad combination, for the high rates prevent the low salaried person from going, and the high risk is equally forbidding to anyone holding an important position. Items (5) and (6) are also bad in combination, for (5) causes most short trips to be of no advantage, and because of (6) the time saved on long trips is to little or no purpose.

The success of some of the European airlines indicates that the airplane and airship, even in their present state of development, are practical commercial carriers if used on specially favorable routes. In many cases, government subsidies are granted but these are not so large, but that they could be more than made up by improvements in the efficiency of operation. British airlines between London and Paris operated for nearly two years without any subsidy. Assistance finally had to be granted them not because of competition with train and boat service but because of competition with French subsidized lines. The German airship line between Friedrichshafen and Berlin made a good profit without outside help other than the use of terminals which had been installed and paid for during the war.

To get air transportation on its own feet in this country will require special attention to the following points:

1. Reconstruction and development of the aircraft industry from a standpoint of transportation rather than manufacturing. The first consideration should be not the machine itself but the purpose which it is to serve.

2. Concentration of effort at first on the most favorable routes, lining up in advance every detail of organization and equipment for safety and economy. A new air line needs just as complete an organization of its kind as a new railroad.

3. The proper design of craft for the particular conditions of use, (military units being often not worth taking as a gift.) The savings, possible through efficient and suitable design are literally enormous, but it must have its due relations to the other factors involved.

4. Carrying only express and mail at first until the safety and reliability of the service is thoroughly demonstrated. Even a well established airline can hardly be a success without a good express business.

5. Development of night flying as soon as possible. The airship is the only feasible unit for this at the present time. In large sizes it is also more economical to operate than airplanes, besides being roomy, comfortable and practically free from the motion which causes sea-sickness.

6. Establishment of easily accessible municipal terminal airdromes. These to a large extent must be a parallel growth to that of the transportation lines themselves.

7. A thorough understanding that cooperation rather than competition will be the keynote of success, in which the government should play its part always from a standpoint of developing aviation as a transportation industry. It is certainly reasonable to expect the government to do at least as much for aircraft as it does for shipping, whenever aircraft lines are started in real earnest.

When these things are adequately taken care of there seems no question but that air transportation will be commercially profitable.

Pilots as Executives

AN interesting requirement of the present Italian regulations for commercial aeronautics is that airport superintendents must be flying officers.

A good pilot often possesses a temperament which makes him ill suited for any administrative capacity. And on the other hand a man in any such capacity must know and appreciate the conditions under which his subordinates work. The obvious solution of the difficulty then is to find the rare combination of good pilot and administrative ability.

When this country selects managers for commercial airports attention will have to be given to the finding of men who combine executive ability with a practical knowledge of flying gained from experience in the air. The successful operation of our airports will depend on our finding men of this type.

Weather Forecasts

SEVERAL recent accidents in aviation have been directly due to a lack of knowledge of weather conditions along the flight course. In view of this the policy recently initiated by the Weather Bureau of a systematic broadcasting of wind and weather forecasts, and storm and hurricane warnings will be welcomed by all who fly.

While all countries have changes in weather peculiar to themselves we doubt whether any of the countries active in aviation have the extremes of climate which are peculiar to our section of this continent. These extremes alone, not to mention extraordinary variations in terrain, cause sudden and violent changes in weather. Knowledge of these changes is vital to aerial pilots and navigators, and they will make good use of the Weather Bureau's new service.

The Commercial Airplane

By L. B. Lent

A broad performance specification for a commercial airplane can briefly be stated as follows: an airplane which will carry the greatest useful load over the greatest distance without stop at the highest speed. Such a performance is, of course, ideal and is the standard by which we measure accomplishment. Cost of operation is a most important consideration in commercial work, and is so affected by many factors that a brief discussion of them will not be amiss. The writer's observations and opinions are based largely on his experience in the Air Mail Service, which is essentially commercial.

Speed

Speed is the dominating factor of the airplane and is the factor which justifies the use of that machine in commercial work. The average speed of the present commercial airplanes is about twice that of the fast trains, or about 80 to 90 m.p.h. This speed is of course ground speed, and as an airplane is frequently called upon to fly into head winds of 30 to 40 m.p.h. it should be capable of an air speed of 110 to 125 m.p.h. Unless these fairly high ranges of air-speed are available an airplane when called upon to face a strong head wind will not be able to compete with the fast trains.

High speeds mean the use of high powered engines with a corresponding consumption of fuel and a subsequent greater tank capacity and fuel weight for a given range. On the other hand high speeds mean less time in the air to cover a given distance. Power and the resulting speed do not increase uniformly, the former eventually outstripping the latter, so that there is an economical limit to the engine power of the present commercial airplane. This limit is peculiar to each type of machine and the conditions under which it operates.

Carrying Capacity

I cannot agree with some designers who advocate increasingly large types of commercial airplanes. Large machines will undoubtedly be useful when developed to a high state of reliability, and when we have airdromes for them. But at the present time I believe a better operating record can be made with a large number of small machines rather than a few large ones. Operating machines on a daily schedule irrespective of weather conditions is a different matter from sending out an occasional machine when its condition and that of the weather warrant flying. In carrying a given daily load I think it better to distribute it among small machines rather than "to put all the eggs in one basket", so to speak.

I will classify machines as small and large those carrying up to 1000 lb. of useful load and those carrying more than 1000 lb. respectively. The limit of the useful load which can be carried by a single engine machine is as a rule about 1000 lb. In considering the relative advantages and disadvantages of the small single engine and the large multi-engine airplane let me mention a few of my field experiences. In these experiences I have had trouble with both types, but especially with the large machines.

On cold winter mornings engine starting is frequently difficult even though the machine has just been serviced with hot water and oil. By the time it has been brought from the hangar to the starting position both oil and water have cooled to such an extent that they have to be drained off and replaced with some which are warmer. Machines equipped with Liberty engine and battery ignition are frequently troublesome on account of the battery weakening from the drain of ignition current in the many attempts to start and the consequent necessity of installing a new battery. Occasionally a gasoline, oil, or water leak will require attention at the last moment; or possibly a freshly packed water-pump stuffing box will require tightening up. All of this admittedly gloomy picture means that to dispatch even a single engine machine under adverse conditions is difficult while to do the same thing with a two engine machine is more than twice as difficult.

In a twin-engine machine one engine is started at a time and if there is any delay the other one will easily freeze up. In the majority of such airplanes the engines are mounted between the wings and consequently all the leads for temperature and pressure instruments are in an exposed position between the engine mounting and the cockpit. As a result the oil pressure gauge fails to register correctly until the column of oil in the connecting lead has reached a temperature which permits of a viscosity low enough to actuate the gauge. No sensible pilot will take off until he is sure the oil system is functioning properly, and the remedy for these troubles is to equip the engine with "oil seals". What needs to be emphasized is that it is difficult enough to despatch a single engine machine in winter weather, such as we have in some sections of the country, without bothering about multi-engine machines.

The maintenance work on large machines, also, is considerable, the inspection and checking alone requiring much time and attention.

The weight of a large machine must be supported on a landing-gear of sufficient strength to guarantee a safe landing. Landing at the present depends on the pilot's skill and the condition of the airdrome. There is, therefore, a limit, in our present designs, as to the weight and size of machines. Beyond this limit it is probable that the machines will have to alight on water.

The question of forced landings also requires consideration. Large machines can be so powered with three or more engines as practically to eliminate the chances of a forced landing from engine trouble. I mention three or more engines because a twin-engine machine is not justified. One reason for more than one engine is to create a reserve of power which can be used to prevent a forced landing. A two engine machine will not fly properly on one engine. In a three engine machine, however, the power lost by the stoppage of one engine is not sufficient seriously to deter a properly loaded machine from keeping to its course and reaching its destination.

Present indications point to the next step in the development of the commercial airplane in this country being a machine with a three engine power plant driving a single tractor propeller. After all this is a logical and rational development. Such a machine will probably be designed to fly on two engines, thus leaving the third in reserve for emergencies and for taking off. Such a machine might even "limp" into an emergency landing field on one engine. Until this development takes place in large multi-engine airplanes this type will not be as economical and reliable as the small single engine machine.

Distribution of Load

The total load may be divided into necessary load, which includes pilot, fuel, oil, and water; and pay load, which is made up of cargo. This is assuming that all accessories are permanent and part of the weight of the machine. The weight of the pilot and water may also be assumed as fixed; thus leaving the remainder of the total load to be divided between fuel, oil, and the pay load. For a given type of engine the fuel and oil load will depend on the time of flight projected. It is obvious then that the amount of pay load which can be carried will vary inversely as the distance to be covered. Here is where engine economy counts, and the direct result of low fuel and oil consumption will be a correspondingly greater pay load. It is desirable to fly as far as possible without reserviceing as this decreases the number of service stations required and consequently cuts down their establishment and maintenance costs. A certain number of take offs and landings, with their accompanying chances of damage, are also eliminated. It is therefore necessary to strike the happy medium between all necessary load with no pay load, and all pay load with no fuel.

A measure of the commercial value of an airplane is the pounds of pay load carried per gallon of fuel consumed. This measure depends upon the size of the power plant in horsepower and the fuel consumption per horsepower hour under

operating conditions. A surprising range of values is obtained from an analysis of the performances of several types of machines. The figures obtained by the writer varied all the way from 1500 lb. of useful load carried by a 200 hp. engine consuming 10 gal. of fuel per hour to 400 lb. carried by a 400 hp. engine consuming 25 gal. per hour. The economical commercial airplane must carry a high pay load per gallon of fuel consumed per horsepower hour.

Points of Design

In addition to the features of design which have already been discussed there are certain others which make for ease of maintenance, repair, and upkeep with a resulting material reduction in field costs. A few of these features merit consideration.

Fuel and oil pipe lines should be of such material and so installed as to be least affected by vibration. Their installation should also be governed by ease of access, as should the installation of all parts, such as control cables and instrument leads, which require frequent inspection. Wings should be interchangeable, and in the case of large machines should be made in sections so that in the event of damage the particular section needing repair can be replaced. In single engine machines the nose of the fuselage together with the power plant should be detachable to facilitate ease of engine replacement and repair.

The consideration here given to the desirable features of commercial airplanes is necessarily brief. However it is a subject which must be thoroughly investigated if a type of commercial airplane is to be evolved which will give both a reliable and a profitable performance.

First Free Balloon Flight in the Philippines

The first free balloon flight in the Philippine Islands was made on Friday, May 20th, from Corregidor Island by the 27th Balloon Company, using a Caquot Type "R" Observation Balloon. The only change made in the balloon used was cementing the rip panel, instead of having it sewed, and changing the valve cord by bringing it down through the diaphram in order that more direct pull could be obtained on the valve. The balloon when received had been in its original chest from the factory for over 18 months and had deteriorated to such an extent before being flown as a captive balloon that it had to be patched in three hundred and fifty places and, in spite of this fact, after two weeks it had to be condemned on account of porous fabric.

Corregidor is situated 30 miles down the bay from Manila, and the only time it is possible to make a free balloon trip is between the months of May and October, during the typhoon winds which blow in a northeasterly direction towards the mainland. During the other months of the year the Monsoon winds blow southwest direct to the open China Sea, making flights impossible. An added disadvantage to free flights from Corregidor is the fact that, unless the wind carries the balloon within ten miles either side of the City of Manila, a landing would ordinarily have to be made in the "Bundocs" (uplands).

The balloon left Corregidor at 3:50 p.m. with 1st Lieut. W. A. Gray, pilot; Warrant Officer Robert E. Lassiter, assistant pilot; and Staff Sergeant F. C. Goldquist, all of the 27th Balloon Company. The wind was blowing about 15 miles an hour directly up the bay in the direction of the City of Manila. Not having a statiscope, an altimeter which registered in 200 ft. intervals only, was used. Due to this fact, a great deal more ballast was used than ordinarily, as this particular type of altimeter registers about 200 ft. late in changes of altitude and the passengers being interested at times in watching the sharks and Japanese fishing smacks in the bay, it registered from 200 to 400 ft. change before being noticed, which was an actual change of perhaps 500 to 700 ft. Thus, several times too much ballast was thrown out to break the fall, causing the balloon to ascend higher than desired. In Manila Bay the air about 300 ft. is full of eddies and on this trip the balloon kept turning continually.

When opposite the Naval Station at Cavite, 17 miles from Corregidor, the balloon ran into a tropical rain storm, which swept it along in its course in a northerly direction. As the fabric got wet huge bubbles of hydrogen were seen floating in the atmosphere, due to the porous fabric.

About 5:15 p.m. the balloon was over the land, and after traveling six miles over low marshes the drag rope was dropped. At 5:40 it began to get dusk, and a dry field close to a main road and railroad station was chosen for a landing field. The balloon was valved down, the panel ripped about 40 ft. from the ground, and the basket was set on the ground with only the slightest jar, making a landing which could not have been bettered by a spherical balloon. The rip panel only partly came off, thereby consuming a much longer time for the gas to escape than usual.

On landing, at least 1500 Filipinos rushed on the field towards the bag, and as these natives continually have lighted cigars and cigarettes in their mouths, it looked as if there was a good chance of a fire breaking out in a few seconds unless the crowd could be kept a distance away; and explaining to a crowd of Filipinos who only speak Tagalog is some job. Happily, the "Presidente" of the town (which proved to be Bocaue, Bulacan Province, 25 kilometers from Manila) was in the crowd, and with his help order was obtained. The Filipinos in their native foot wear, bare feet, did good work helping to deflate and roll up the wet balloon for shipment. After this work was done the "Presidente" insisted upon entertaining the aeronauts for the next two hours, and his hospitality was so good that the aeronauts hope another landing can be made in this town sometime in the near future. The total distance of this flight was sixty kilometers.

New Aviation Spark Plug

A new aviation spark plug which shows great promise for high compression engines has been developed by C. B. Coombs engineer of the United Automotive Interests, Inc., of New York. Mr. Coombs is widely known in the aviation field not not only as a pilot but for his technical and engineering knowledge of aircraft and engine problems. For five years, including the entire war period, he was an instructor and test pilot, and has probably had more experience on all types of American and foreign machines than any other American pilot. As a sergeant pilot he was in charge of test flights of machines and equipment by the engineering division of the Army Air Service at McCook Field.

With a broad knowledge of aviation ignition problems Mr. Coombs has for the past several months been working on a new plug which has recently passed Bureau of Standards, Army and Navy tests. The Coombs plug has new features, several of which have been patented, which make it particularly adaptable to high compression engines. During the McCook Field test a set of these plugs successfully withstood a compression ratio of 6.1 with ordinary gasoline, which is said to be the first time a plug has stood up at such a high ratio with undoped fuel.

New Airplane Engine

The Cleveland Engineering Laboratories Co. is engaged in the construction of a two cycle airplane engine of new design. The engine is of the radial type with six cylinder units, each unit being made up of two cylinders, the pump clyinder and the firing cylinder. The former draws the fuel from the carburetor and forces it at a high velocity through a by-pass port into the latter just as the exhaust port begins to open. The damp charge falls on the burnt one like a blanket, scavenging the firing cylinder completely. The crank shaft and connecting rods operate similar to those of the conventional four cycle radial engine.

Tests of the engine are as yet incomplete and so no data concerning its power output are available, but the fuel consumption is expected to be very low.

Pensacola to St. Louis

A recent creditable performance was the flight of Lieut. F.P. Applegate, U. S. N., from Pensacola, Fla. to St. Louis, Mo. in 13 hr. flying time. The machine used was Curtiss N-9 float seaplane and the route followed the gulf shore to New Orleans and thence up the Mississippi River to St. Louis.

The flight was made for the purpose of preparing a report on flight conditions along this route.

Italian Air Routes and Ports

The control of civil aviation in Italy is entrusted to the Aviation Division (Comando Aviatori) through its Airports and Airways Bureau, until such time as permanent legislation is enacted. In view of this all airports and military airdromes open to civil traffic must, as far as such traffic is concerned be considered under the direct jurisdiction of the Airports Bureau, Aviation Division, despite this organization being under the Command of the Field. Consequently the various Field Commanders, in all matters pertaining to civil aerial traffic, communicate directly with the above mentioned Airports Bureau, Aviation Division, in accordance with the following rules.

National Airways

The airways which the Italian High Command of Aeronautics intends to organize for civil aviation comprise the following routes, airports and emergency airdromes.

(a) *Nice-Rome-Naples-Brindisi Line:*
1st class airports: Albenga (to be erected) - Francesco Baracca (Rome), S. Vito dei Normanni (Brindisi);
2nd class airports: Capodichino (Naples);
3rd class airports: Sarzana-San Giusto (Pisa) - Campiglia;
Emergency airdromes: Orbetello, Furbara, Mesa, Benevento, Foggia, Bari.

(b) *Udine-Bologna-Aneona-Brindisi Line:*
1st class airports: San Vito dei Normanni (Brindisi);
2nd class airports: Campoformio (Udine) - Bologna;
3rd class airports: Aspio (Ancona);
Emergency airdromes: Aviano, Arcade, Padua, Ravenna, Pescara, Foggia, Bari.

(c) *Turin-Milan-Verona-Venice-Triest Line:*
1st class airports: Sesto San Giovanni (Milan). Until the time when the airport at Sesto San Giovanni will be ready, the one in Taliedo will continue to be used.
2nd class airports: Mirafiori (Turin) - Ganfardine (Verona);
3rd class airports: San Niccolo' di Lido (Venice) - Zaule (Triest);
Emergency airdromes, Ghedi (Brescia), Padua.

(d) *Milan-Sarzana Line:*
1st class airports: Sesto San Giovanni (see note under *c*);
2nd class airports: nil;
3rd class airports: Sarzana;
Emergency airdromes: Piacenza, Borgotaro.

(e) *Turin-Bologna Line:*
1st class airports: nil;
2nd class airports: Mirafiori (Turin) - Bologna;
3rd class airports: nil;
Emergency airdromes: Alessandria, Piacenza, Parma.

(f) *Central European Line (Verona-Innsbruck):*
1st class airports: nil;
2nd class airports: Ganfardine (Verona);
3rd class airports: nil;
Emergency airdromes: Trent, Bolzano.

(g) *Campiglia Marittima - Cagliari Line:*
1st class airports: nil;
2nd class airports: nil;
3rd class airports: Campiglia, Marittima-Terranova, Pausania-Cagliari;
Emergency airdromes: Borore.

(h) *Naples-Catania Line:*
1st class airports: nil;
2nd class airports: Capodichino (Naples) - Catania;
3rd class airports: nil;
Emergency airdromes: nil;

Some of the emergency airdromes mentioned above (particularly those at Aviano, Padua, Ghedi, Furbara, Foggia, Alessandria, Parma, Ravenna, Pesaro) are squadron and group centers. It will, therefore, be possible to maintain service for the supply of fuel and oil for civil aircraft.

The organization of Seaplane routes will be mentioned later. It may be anticipated that it is the intention of the Ministry of War to proceed with the construction of a civil seaplane station at Brindisi (Bocca di Puglia). Those at San Remo and Desenzano have been maintained for the present; the former having been rented to the S.A.I.A.M. Co. of Milan, which also owns airports at Arcore and Erba Incino and a seaplane station at Pusiano. So far, therefore, under the agreement made with the Inspectorate of the Royal Italian Navy, the following naval seaplane stations (except the two at San Remo and Desenzano mentioned above) are open to civil traffic: San Remo, Orbetello, Ostia, Napels, Siracuse, Brindisi, Largo Varano, San Nicollo' di Lido. The stations at Spezia and Pola, are closed to civil traffic for military reasons.

The Operation of Airports

The airports named above will each be the center of a zone within the limits of which the airport commander will exercise his jurisdiction. As the airports at Albenga, Sarzana, Campiglia Marittima and Ganfardine are not in a position to operate alone at present, they will be included in the zones of the nearest airports, viz:

The one at Albenga under the jurisdiction of Mirafiori
" Saranza " " San Giusto
" Campiglia " " San Giusto
" Ganfardine " " Bologna.

The duties of airport commanders are as follows:

(a) To see that all aircraft, clearing, arriving, or in transit, have complied with regulations; (b) To keep records and documents such as the aircraft register and the record of the movements of machines; (c) To sign the documents of aircraft clearing, arriving or passing in transit; (d) To keep informed of whatever concerns the legislation or regulation of national or foreign aviation, so as to be in a position to exercise proper control and to furnish explanations and information when required; (e) To see that owners of aircraft within his zone comply with the law; (f) To prosecute violaters of the law and to send report of violations to the Aviation Division for transmittal to the Royal Ministry of War (High Command of Aeronautics); (g) To superintend the operation of the various services connected with civil aviation such as telephone, radio, photography, meteorology, sanitation and motor transport in his zone; (h) To further the interests of air navigation in the speediest form, and lend to it his most earnest efforts; (i) To regulate departures and landings in the airports under his jurisdiction, to collect landing, clearing, stay and shelter fees, and the payment of rents; (j) To maintain the equipment of the airports; (k) To provide fuel and oil for machines engaged in aerial traffic ceiver of materials, 3 supply men, 4 telephone operators, 3 office clerks, (1 typist), 1 cashier, 1 accountant, 3 watchmen, 8 ground men and 2 rigers. To this number must be added semaphore, radio and searchlight operators, and aerologists in accordance with the importance of the station. The latter's personnel may also comprise a number of factory hands where aircraft construction is contiguous to the station.

An airport staff is generally composed of: 1 airport commander, 2 sanitary officers, 2 ground officers, 1 employee, 1 receiver of materials, 3 supply men, 4 telephone operators, 3 office clerks (1 typist), 1 cashier, 1 accountant, 3 watchmen, 8 ground men and 2 riggers. To this number must be added semaphore, radio and searchlight operators, and aerologists in accordance with the importance of the station. The latter's personnel may also comprise a number of factory hands where aircraft construction is contiguous to the station.

The airports of Rome, Milan, and Turin will, for the present, be organized along thise lines. The others will retain only the personnel which is considered indispensible.

The office of airport commander will be held by the officer having the highest rank among the section commanders; he must, however, be a flying officer. The men assigned to ground work will have the rank of military pilots.For the present, airport services will be discharged by the sections now in the field, without any increase in the personnel, as the present needs of aerial traffic do not require more. Airport commanders—as far as civil aviation is concerned—work under the Aviation Division (Airports and Airways Bureau).

The Aviation Building Section may arrange contracts for renting hangars or airports to private interests.

At airports where there is both military and civil flying the two will, as far as possible, be kept separate. Such separation will be made by the Ministry of war (High Command of Aviation) through the Aviation Division. In civil aviation the military authorities will have no jurisdiction and will not interfere. Navy yard commanders will assume the duties of airport commanders in all matters concerning lighter-than-air craft and their operation. Similarly, commanders of dry docks will act as airport commanders. The Royal Naval Inspectorate of Aeronautics and the Airship Division, each for its own sphere, will determine zones for the various navy yard commanders, and within such zones they will exercise their command in all that pertains to civil seaplanes and lighter-than-air craft.

Agreements will be entered into to regulate the relations between navy yard commanders and the Airport Bureau in everything pertaining to civil aviation. The aerologic service will maintain stations at Albenga, San Giusto, Campiglia, Capodichino, Benevento, Foggia, Brindisi, Campoformido, Bologna, Aspio, Pescara, Mirafiori, Taliedo, Ganfardine, San Niccolo' di Lido, Zaule, Parma Catania, Terranova, Cagliari and Gardolo. The aerologic service will send daily weather forecasts for the next day to all active airports.

The present order will be enforced as from July 1, 1921.

New Uses for Aircraft in Canada

Among the new uses which are continually being found for aircraft in Canada, it is of more than usual interest to announce two novel instances in which seaplanes were recently employed to advantage on the Pacific Coast in connection with the operations of the Vancouver Air Station.

At the request of officials of the Department of Marine & Fisheries, several flights have been made for the purpose of carrying eyed fish eggs from the hatcheries to places along the coast line where the eggs were placed under water in special boxes invented by one of the fishery officers and allowed to complete hatching there. By this means it was found possible to plant eyed eggs in places which had formerly been almost inaccessible, because of the loss of time necessary in covering the distance from the hatcheries to the waters where it was desired to place the eggs for hatching.

In a recent flight to two hatcheries the Chief Inspector of Fisheries in British Columbia found that instead of taking from six to eight days, as formerly, to visit the two hatcheries, he was able to leave Vancouver at eight o'clock in the morning, spend three hours at each of the hatcheries, and get back to Vancouver by six o'clock the same evening. This has been a valuable saving of time for him and his assistants, and on the way back to Vancouver they had also been able to overhaul and inspect a number of fishing craft to make sure that they were not poaching in forbidden waters.

On behalf of the Department of Customs and Inland Revenue the "Empress of Japan" and "Empress of Russia" have on several occasions recently been escorted by an air patrol into the port of Vancouver for the purpose of preventing the smuggling of opium and other prohibited drugs into Canada. It appears that on approaching the port of destination would-be smugglers have been resorting to the practice of dropping overboard their illicit contraband which is then picked up and taken ashore by small powered craft.

The seaplane on each occasion carried on board a representative of the Customs Department and after meeting the incoming boat, while still about two hours out, escorted her into port flying at a height of approximately 1000 ft., from which height a careful lookout was maintained, for any signs of the suspected smuggling.

Although no suspected individuals were actually apprehended on these occasions, a number of suspicious looking small craft were stopped and their clearance papers etc., examined, with the result that on subsequent occasions the moral effect of the previous patrols was found to have been most striking, as evidenced by the very wide berth given the incoming steamers by all the small craft in the vicinity. Further evidence of the success of these patrols in effectually preventing this form of smuggling was found in the abnormal fluctuation of the local prices of these drugs in Vancouver which rose to such an extent that supplies of the commodity previously sent to Seattle, Washington, were actually being sent back to Vancouver to take advantage of the higher prices.

The Collector of Customs at Vancouver has, in fact, been so well satisfied with the excellent results accomplished by these initial experiments that arrangements have now been made with the air station superintendent at Jericho Beach to have all the principal steamers to and from the orient regularly escorted in his way by a seaplane (with Customs Official on board) on both incoming and outgoing trips. Further developments along this line will, therefore, be watched with keen interest.

Fiat Three Passenger Airplane

The Fiat A. L. 300 hp. airplane is a single engined biplane with the passenger cabin in the fuselage.

Wing Structure: The top planes are joined with a mortise at the center section and the bottom planes are joined in the same way to the fuselage. The port wings are greater in span than the starboard wings by 7 cm. to correct for the propeller tongue. The bottom planes have 2 deg. dihedral, while the angle of incidence on both top and bottom planes is 3.5 deg. The top planes are fitted with lift balanced ailerons. The gravity fuel tank is built in the center section of the top plane and is supported by the cross piece connecting the center section struts. The spar structure is of the solid type. The interplane struts are of the Warren truss type of stream lined steel tubing.

Fuselage: The fuselage is of the orthodox longeron construction. The longerons are of ash and spruce in two parts joined just aft of the cockpit; the forepart is of ash and the rearpart of spruce. The fuselage bracing is done with wire and plywood. The whole structure is plywood covered supplemented, fore of the cockpit, with soft steel sheeting. Directly aft of the cockpit is the cabin which has accommodation for three passengers. Opening aft from the cabin is the toilet room.

Tail Plane: The tail plane is adjustable and carries balanced ailerons and rudder. The structure is of wood with the exception of the control fittings.

The Power Plant: The engine is a Fiat A-1261S, 300 hp. with a shutter regulated honey-comb radiator mounted in the nose, driving a tractor propeller. Fuel is fed by pressure from the main tank and by gravity from the auxiliary tank.

Landing Gear: The landing gear of the orthodox type with the axle suspended by elastic cord.

Factor of Safety: The factor of safety of the planes and fuselage is 9 while that of the landing gear is 6.

Aeronautical News from South America

Bolivia

There is a project on foot which has the approval of the Bolivian Government for the foundation in that country of an aviation school for the purpose of development of commercial flying and improving communication with the adjoining countries. Included in the equipment of the proposed school will be hangars, machine shops, photographic workshops, and other supplies.

Chile

Two Chilean officers in a DeHaviland airplane recently made a flight from Santiago, Chile, to San Luis, Argentina, it being the first time an airman has flown across the Andes Mountains with a passenger. The distance traversed was over 300 miles.. It was the original intention of the pilot to reach Buenos Aires, but due to exhaustion of gasoline he was compelled to descend before reaching his destination.

Peru

The aerial conquest of the Peruvian Andes was marked recently by the notable achievements of two Italian aviators. After one unsuccessful attempt to reach Cuzco, Aviator Rolandi returned to Lima and made a second attempt the next day, leaving Lima at 8 o'clock and arriving safely at Cuzco at 1 o'clock.

Aviator Ancillotto, who made the first flight between Cerro Depasco and Lima, left Lima at 10:30, arriving at Huancayo in 1 hour and 45 minutes. Both airmen used Spa planes equipped with two Spa motors.

Cross Country Cloud Flying

By Bruce Eytinge

The majority of pilots have, at some time or other, been caught in a storm or have had to fly through clouds and fog. Even the best pilots admit that it is highly undesireable and far from being safe.

Cloud flying is not difficult nor dangerous, especially if the machine is equipped with the necessary instruments, and providing the clouds are not too low.

Fog is more dangerous than storms or clouds. Storm clouds can be seen to form and approach so the pilot can climb over or around them or land when a suitable place is available. Fog is different. It is impossible to fly under it because it hangs too close to the ground and it is unsafe to land in it. To start out in a fog, or through clouds as low as five hundred feet, is not unsafe if favorable weather conditions are known to exist at the destination. But to start out through heavy rain clouds that are just skimming the hilltops, driven by wind in the direction of the proposed flight, while depth and density of clouds persist along the route; and to come down to within 500 feet of the ground to locate the airdrome, is unwise as well as unsafe.

Safety First will be most valuable slogan towards developing aviation rapidly. That does not only apply to commercial aviation. It applies to the Army, Navy, Marine, and Postal Aviation services as well. Every pilot, regardless of his service, must exercise the keenest judgment before flight as well as during it. Every accident is a set-back to the development of aviation. Decrease accidents and increase development.

In the morning of the day of my flight from Bethlehem, Pa. to Garden City, L. I. I knew from weather reports that the clouds over Mitchell Field were only 500 ft. high. At 4 p. m. Mitchell Field Meterological Station reported clouds rising and breaking up and a light west wind. It was comparatively clear at the starting point, so I decided to take-off at once, knowing that the objective would be easy to locate by the time of our arrival as the west wind would cause the clouds to be driven out to sea. As the flight progressed the visibility improved and after passing numerous clouds between 2,000 and 6,000 ft. elevation, and the usual haze over New York, I could see the airdrome ten minutes before landing on it.

The above is of no value for cross-country flying, but it should bring out the importance of knowing thoroughly the existing weather conditions en route before starting.

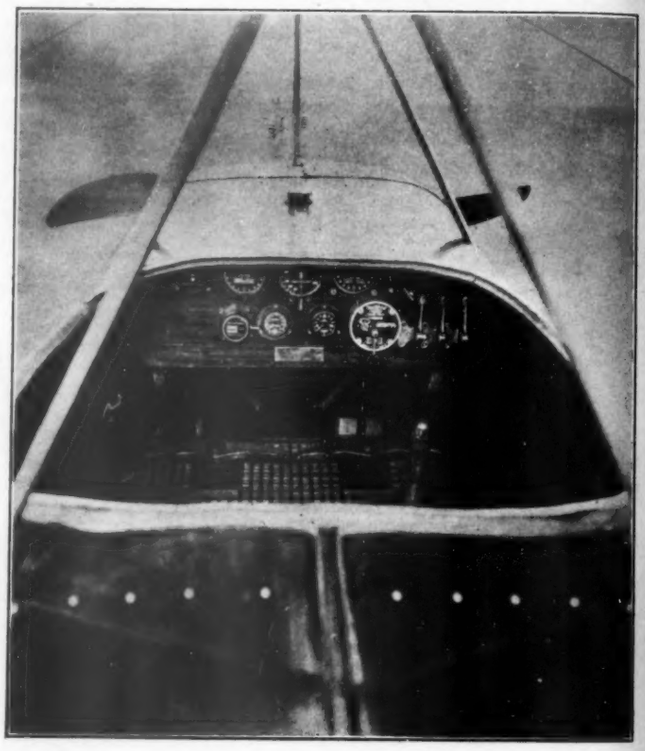
The 105 miles route from Garden City to Philadelphia was new to me but was easy because of the many prominent land marks, as the various race tracks on Long Island, the Bay, Staten Island, the river at New Brunswick, Carnegie Lake at Princeton, the Delaware River through Trenton leading straight into Philadelphia, and the small rough landing field which is three miles southeast of League Island Navy Yard.

A flight of 120 miles from Philadelphia to Washington, with a passenger, proved to be more exciting and necessitated the use of cloud-flying instruments. The evening before the flight an attempt was made at 6:30 p. m. After climbing to 1000 ft. and being unable to see more than 2 miles in any direction I realized that it would be dark by the time of arrival in Washington, due to weather conditions, and so I returned to wait until the following morning. If Washington could have been safely reached before dark I would have gone on even though about 90 miles of the route would have had to be flown by compass. but the route was new to me and the airdrome strange.

At 6 o'clock the following morning the visibility was worse. The haze had developed into a dense low-hanging fog and one could not see a distance of more than half a mile from the ground. At 10:15, after getting a report of clear weather at Washington, cloudy over Baltimore, and a ten-mile an hour wind from the Southwest, which was my course, I took off. The visibility was so poor that no time was lost in circling the field, and I headed at once for Washington.

I was told that the mail pilots used to fly low over the city, just under the clouds, and follow the railroad tracks. Probably that is the safest method for if the weather conditions are about the same all along the route, the pilot is unable to judge accurately, above the clouds and fog, when he is over the objective. This is where the wireless direction finder will play an important part in aerial navigation. Even with the present instruments, one can quite safely come down through the clouds and fog to a safe landing if he has already flown the course and checks it with his compass, air-speed indicator and air-distance recorder.

At 1,000 ft. a short distance from our starting point the ground was lost to view as we climbed through the haze and



COCKPIT OF THE BACO "SKYLARK"

into the clouds to 3000 ft. It is surprising how a machine begins to roll about in the clouds, when you lose sight of the earth and the horizon. I appreciated all instruments because of being tossed about and realized that if the machine should be bumped into a steep dive, side-slip, or a spin I could do no better than come out dangerously close to the ground possibly over a built-up section of the country.

The Pioneer Instruments, as here illustrated are, reading from left to right, top row, a banking indicator. altimeter, air-speed indicator, engine revolution counter and a turn indicator. Bottom row—an air distance recorder, oil temperature gauge, oil pressure gauge, dual ignition switch, carburetor-choke lever, altitude adjustment lever and a spark retard lever. A compass was mounted, after this photograph was made, on the cowling behind the wind-shield.

When flying in fog or clouds, or at night, the greatest difficuty is experienced in holding an airplane on a straight course. The compass is of little help, as its successful operation depends largely upon a straight course being maintained; and once a turn is started, throwing the compass off meridian, it offers no assistance whatever in regaining the course. The turn-indicator is an instrument which shows when the plane is turning. By steering so as to prevent this instrument from indicating, a straight course can be maintained, the direction

of which is given by the compass. Should a turn be made, its direction will be indicated and the course can be quickly regained. The banking indicator aids in maintaining lateral stability. The altimeter is of little value in helping to keep the machine from nosing up into a stall which would result in a falling off on one wing into a spin, or in nosing down into a dive. The instrument to prevent this is the air-speed indicator, which shows a decrease in speed in nosing up into a stall, or an increase in speed is nosing down into a dive. The engine revolution counter acts practically the same. That is, it decreases in revolutions per minute during a climb, or increases in revolutions per minute during a dive. A reliable air-speed indicator is indispensible. Every airplane has a speed range, whose lower extreme approaches the stalling speed and whose higher extreme approaches the breaking speed. Between these two extremes the airplane may be flown with safety, but for economy the speed should be about halfway between. For the best climbing speed and for making the greatest possible distance with least power, it should be near the lower extreme. For maximum speed with full power it should approach the higher extreme. No pilot is clever enough to keep his machine at the proper speed at all times without the aid of an air-speed indicator. It assures minimum landing speed with safety, maximum climb—in fact, maximum performance in every way.

In cross-country flying it is necessary to know the distance travelled, particularly when flying in bad weather or over unfamiliar territory. The air-distance recorder shows this. It eliminates much of the uncertainty and making allowance for the wind one can be sure of arriving close to his destination. It is especially useful in or above the clouds as it helps one in determining when to come down.

The 110 miles from Philadelphia to beyond Baltimore was flown entirely by the aid of the above mentioned instruments. Assured against turning by the turn-indicator, it was easy to follow the compass course. The banking indicator, together with the air-speed indicator assured an even keel. The engine throttle was set at 1680 r.p.m. for a cruising speed of 70 m.p.h. into a 10-mile an hour head wing, at an altitude of 3000 ft. through heavy clouds and thick heavy mist which obscured the sun.

My passenger aided me in occasionally checking up our course through breaks in the clouds, from the B. & O. Railroad tracks. We could also check up our course by towns and thus at the same time check the distance travelled. Over Baltimore I had to climb to 4000 ft. to avoid dense black clouds, while the haze above us obscured the sun. At no time was the sun visible. Ten miles further on the haze had disappeared and the clouds were breaking up fast. We were over Washington almost before we realized it so in a few minutes were descending through the heat bumps and approaching Bolling Field.

Flying through the clouds in the Baco Skylark is less strenuous on the pilot than in other machines, because it is equipped with an air-cooled engine. This eliminates the necessity of operating a radiator shutter, or watching a water temperature gauge; and as the fuel system is of gravity feed there is no hand pump to operate for pressure.

On July 16 we made a return flight in the Baco Skylark from Washington to Philadelphia via Baltimore. The flight from Baltimore to Philadelphia (93 miles) was made in one hour and ten minutes. The machine landed at the field of the Philadelphia Aero Service Corporation after dark.

Safety of Travel by Air

The Manufacturers Aircraft Association, on completing an aviation survey of the United States, has announced that, in the last six months, the 1,200 commercial airplanes in operation had flown approximately 3,250,000 miles.

The record shows that civilian flying although handicapped by the lack of an American air policy, has established itself as a remarkably safe and dependable means of transportation. In three and a quarter million miles of travel by air, only 15 persons were killed and 43 injured in a total of 27 serious accidents. Most of these accidents occurred among that class of civilian aviators known as gypsy fliers.

Of the 1,200 commercial aircraft, probably 1,000 are under the indirect supervision of responsible manufacturers or transportation companies—and this is the only regulation over flying, as local ordinances or state laws can not be enforced. Lacking a Federal organization controlling civilian aviation, than 200 or more gypsy fliers have been permitted to fly at will and many have met disaster.

Eight of the fatalities and 32 of the injuries in the last six months have been traced to the lack of terminals, routes and storm warnings, or to reckless stunting—errors which would have been corrected or prevented had there been a national air policy. In all the United States there are only 214 adequate municipal or civilian air ports, yet terminals are as necessary to aeriel transport as they are to shipping or the railways. Deducting these preventable casualties, it is found that there was only one death for each 464,285 miles flown and only one injury for each 295,454 miles flown.

Without Federal regulation, it is impossible to assure throughout the country the continuous combination of sound aircraft, satisfactory engine, and competent pilot essential to safety. Without formulating an air policy it is likewise impossible to acquire air ports, disseminate storm warnings or provide air routes. And, finally, is is impossible to enforce regulation, or to operate airdromes, signals or routes without a properly organized body within the Federal Government devoted exclusively to civil aeronautics.

Changes in Station of Air Service Troops

Orders were issued by the War Department transferring the following Air Service troops:

From Kelly Field to Ellington Field, Houston, Texas: 1st Group Headquarters, 17th, 27th, 94th and 95th Squadrons, Air Park No. 2.

To Kelly Field, San Antonio, Texas: Flight "A," 90th Squadron, from Del Rio, Texas. Hqrs. and Flight "B," 90th Squadron, from Sanderson, Texas. Hqrs. and Flight "A," 8th Squadron, from McAllen Texas. Detachment, 8th Squadron, from Laredo, Texas. Flight "B," 13th Squadron, from Marfa, Texas. Hqrs. and Flight "A," 13th Squadron, Hqrs. Detachment 1st Surveillance Group, and Photo Section No. 1 from El Paso, Texas. (Three men will remain at each border station abandoned).

From March Field, Riverside, Calif. to Kelly Field: Detachment of 200 enlisted men or such part thereof as may have six months to serve.

From Chanute Field, Rantoul, Ill. to Bolling Field, Anacostia, D. C. One Staff Sergeant and 29 privates from School Detachment.

From Mather Field, Sacramento, Calif. to Ellington Field, Houston, Texas: Detachment of 200 enlisted men, or such part thereof available with at least six months to serve.

From Montgomery Air Intermediate Depot, Montgomery, Ala.: Air detachment demobolized and personnel, approximately 53 enlisted men, sent to Ellington Field. Four Staff Sergeants, 10 privates, 1st class, and 46 privates to Carlstrom Field.

From Selfridge Field, Mt. Clemens, Mich: Supply detachment demobolized, and the four men sent to Scott Field, Belleville, Ill.

From Aberdeen Proving Ground, Md. to Mitchell Field, L. I., New York: Twenty unassigned privates, no men with less than 6 months' service to be sent. Casual detachment of two men from Governors Island, N. Y. sent to Mitchell Field.

From Rockwell Field, San Diego, Calif. to Post Field, Fort Sill, Okla.: One Staff Sergeant, one sergeant, one corporal, 25 privates, 1st class, and 275 privates; no men with less than 6 months service to be sent.

To Consider Air Transport Problems

The Chamber of Commerce of the United States announces the appointment of two committees to deal with transportation, one of which will consider problems relating to the general field of transportation and communication, while the other will concern itself with railroad problems.

The general transportation committee also will be called on to take up the problem of air transport.

"Who's Who in American Aeronautics"

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Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Joseph Lafeton Whitney

WHITNEY, JOSEPH LAFETON, Commercial Aviation; born, Hubbard, Iowa, Sept. 7, 1894; son of A. F. Whitney and Grace E. (Marshman) Whitney.

Educated: Austin High School, Chicago, Ill.; A.B. 1917, University of Illinois

Professional: Curtiss Aeroplane & Motor Corp., 1920.

Aeronautical Activities: Ground School, University of Illinois, Oct. 1917; flying cadet, Kelly Field, Dec. 1917; flying instructor, Kelly Field, officer in charge of acrobatic flight; victory loan flying circus; with Curtiss Aeroplane & Motor Corp., June 1919 to date.

Flying Rating: Aero Club of America F.A.I. pilot certificate No. 1338, March 1918; Reserve Military Aviator.

War Service: U. S. Air Service.

Member: Aviation Club of Chicago.

Present Occupation: District Manager, Curtiss Aeroplane & Motor Corp.

Address: 30 North Michigan Ave., Chicago, Ill.; home, 834 Fair Oaks Ave., Oak Park, Ill.

George Birkbeck Post

POST, GEORGE BIRKBECK, Commercial Aviation; born, New York City, Jan. 9, 1897; son of Abram S. Post and Ida C. Post.

Educated: Kirmayer School, New York City; three years of mechanical engineering at Cornell University.

Professional: Experimental Department, Standard Aero Corp., 1917; salesman, Packard Motor Car Co. of New York, 1920; Huff-Daland and Co., June 1920 to date.

Aeronautical Activities: Elementary training in Naval Flying Corps, Bayshore, L. I., 1918; advanced training at Pensacola, Fla.; several hundred hours commercial flying in small boats; experimental flying in numerous land machines, training planes, etc.

Flying Rating: Naval Aviator Certificate No. 1198.

War Service: Machinist mate, U.S.N.R.F. from April 1917 to Oct. 1917.; patrol work, aviation, Feb. 1918 to Jan. 1919.

Member: Aero Club of America.

Present Occupation: Aeronautical work.

Address: Huff-Daland & Co., Inc., Ogdensburg, N. Y.; home, 292 Riverside Drive, New York City.

Garrett B. Linderman, Jr.

LINDERMAN, GARRETT B., JR., Commercial Aviator; born, Bethlehem, Pa., Aug. 22, 1891; son of G. B. Linderman and Jennie S. (Brodhead) Linderman.

Educated: E.M. 1914, Lehigh University.

Professional: 1914-1917, mine examination work; 1917-1919 naval aviation.

Aeronautical Activities: Naval Aviation Instructor.

Flying Rating: Naval Aviator No. 1799; Aero Club of America hydro aeroplane No. 526.

Member: Aero Club of America; Aero Club of Pennsylvania.

Present Occupation: Vice President and Engineer, Bethlehem Aircraft Corp.

Address: 2nd Ave. and Union St.; home, 506 Del. Ave., Bethlehem, Pa.

Otto Enderton

ENDERTON, OTTO, Commercial Aviator; born, Knob Hill, Calif., April 21, 1897; son of William H. Enderton and Ollie M. Enderton.

Educated: High school, Nogales, Ariz.; State Normal School, Tempe, Ariz.

Professional: Hoisting and Steam Engineer, Commercial Aviation since March 28, 1919.

Aeronautical Activities: Located Marine Flying Field, Miami, Fla. during year 1918 until March 1919, flew JN4H, H boats, etc.; engaged commercial aviation since that time; employed by Kokomo Aviation Co., Kokomo, Ind., Clinton, Ind., Arizona Aviation Co., Tuscon, Ariz., Apache Aerial Transportation Co., Phoenix, Ariz., Barr's Flying Circus, Venice, Calif.; now in business operating under name of KandE Co.

War Service: Marine Aviation duration of the War.

Member: Aero Club of Southern California.

Present Occupation: Commercial Aviation.

Address: Yuma, Ariz.

Joseph L. Cato

CATO, JOSEPH L., Aeronautical Mechanical Engineer; born, North Yakima, Wash., Feb. 18, 1889; son of Joseph Leo Cato and Mary (Olsen) Cato.

Educated: Private schools, Vancouver, Wash.

Professional: Aeronautical experimental work.

Aeronautical Activities: Gliders and motorless flight from 1903 to 1909; built Curtiss type biplane and made first flight Oct. 9, 1909, Sunset Aviation Field, Alameda, Calif.; 1910, built first air-cooled two-cylinder engine 5 in. bore by 5½ in. stroke; April 1910 to April 1913, associated with H. W. Blakeley in building experimental airplanes; April 1913 to Nov. 1915 built two biplanes for sport flying and one four-cylinder 60 hp. water cooled motor for one of these planes; Nov. 1915 to April 1916, employed by Sloane Aeroplane Co. doing experimental work and assistant manager of general assembly; April 1916 to Dec. 1918, employed by L. W. F. Engineering Co. as Aeronautical Experimental Engineer; Dec. 1918 to June 1919, employed by Marlin-Rockwell Corp. to develop a small sporting monoplane and the Cato 72 hp. ball bearing air-cooled motor using the Cato internal cooling system; June 1919 to Dec. 1920, employed by L. W. F. Engineering Co. as Aeronautical Mechanical Engineer to develop a small motor and plane called the Butterfly Sporting Monoplane; May 1921, employed by Engineering Division, Air Service, McCook Field, as Project Engineer and assistant to Capt. Geo. E. A. Hallett in developing air-cooled radial engines.

Member: Aero Club of America; Society of Automotive Engineers.

Present Occupation: Aeronautical Mechanical Engineer, Engineering Division, Air Service.

Address: Room 210, Power Plant Section, McCook Field; home, 121 Iroquois Ave., Dayton, Ohio.

Joseph Lemuel Walker

WALKER, JOSEPH, LEMUEL, Commercial Aviator; born, Oakland City, Ind., Aug. 20, 1895; son of Patrick E. Walker and Mary R. Walker.

Educated: Public schools of Oakland City; Aeronautical Engineering, 1920, Chicago Tech.

Professional: Automobile business from 1912 to 1917.

Aeronautical Activities: Started instruction at Tours, France, May 1918; Engineer Officer at Romrantin, France, Sept. 1918 to Jan. 1919; flew Forest Patrol with 91st Aero Squadron also Mexican Border Patrol, 1920.

Flying Rating: Airplane Pilot.

War Service: Air Service, March 1917 to Oct. 1920.

Present Occupation: Manager, O'Neal-Walker Aerial Service.

Address: Box 63; home, 618 Sherman Street, Oakland City, Ind.

Herbert Ray Warner

WARNER, HERBERT RAY, Real Estate; born, Wayne Co., Mich., Oct. 3, 1894; son of Ammon B. Warner and Ella Warner.

Educated: Plymouth High School; Michigan Agricultural College.

Aeronautical Activities: Training as night bomber at Pensacola, Fla. and Miami, Fla.; active duty at Northern Bombing Group, France and at U. S. Naval Air Station, Moutchio-Lacanau, France.

Flying Rating: Naval Aviator No. 732.

War Service: Navy, Feb. 1918 to Jan. 1919.

Present Occupation: Building and Real Estate.

Address: Kalamazoo, Mich.

Mentor Etnyre

ETNYRE, MENTOR, Oil business; born, Ashton, Ill., Sept. 28, 1885; son of Fred Etnyre and Lelia (Bly) Etnyre; married, Carita A. Goeth.

Educated: Two years high school and special work.

Professional: Organization work and business management.

Aeronautical Activities: 1918-1919, training at Kelly Field, Camp Dick, Ellington Field.

Flying Rating: Reserve Military Aviator, June 1918.

War Service: Army, May 1917 to Jan. 1919.

Present Occupation: Business Manager, Austin Film Library, Inc., Austin, Tex.

Address: 807 Littlefield Bldg.; home, 307 West 7th St., Austin, Tex.

Samuel Herbert Mapes

MAPES, SAMUEL HERBERT, Capitalist; born, Hillburn, N. Y., April 28, 1882; son of Samuel Strong Mapes and Hannah (Conkling) Mapes; married, Julia Pierson, July 11, 1906.

Educated: Public schools of Hillburn, N. Y.; Herbart Preparatory Academy, Suffern, N. Y.

Aeronautical Activities: C. O., 66th Aero Squadron, Kelly Field; C. O., 1st Group, 2nd Wing, Kelly Field; C. O., 2nd Wing; C. O., 380th Aero Squadron, Selfridge Field; Personnel Adjutant, 1st Training Brigade, Mineola, L. I.

War Service: Captain, Air Service, U. S. Army.

Books: "Mapes History."

Member: 32° Mason Knight Templar and Shriner; Union League Club; Thousand Island Yacht Club; War of 1812; Sons of Revolution; Military Order of Foreign Wars.

Present Occupation: Capitalist.

Address: 1 East 39th St., New York, N. Y.; home, Suffern, N. Y.

Raymond K. Bevier

BEVIER, RAYMOND K., Instructor of Aeronautics; born, New Ulm, Minn., March 19, 1892; son of Mrs. Elizabeth Bevier.

Educated: Emerson School and North Central High School, Spokane, Wash.; Stanford University.

Aeronautical Activities: March Field, Nov. 1918 to March 1919; teaching aeronautics at Polytechnic Evening School at present.

War Service: 2d Lieut., U. S. Air Service, Feb. 1918 to March 1919.

Present Occupation: Instructor of Aeronautics Polytechnic Evening High School.

Address: 319 S. Grand Ave., Los Angeles, Calif.; home, 702 Alice Ave., Spokane, Wash.

Alfred B. Baker

BAKER, ALFRED B., 1st Lieut., U. S. A.; born, May 30, 1891; son of John Baker and Amia L. Baker.

Educated: McKinley High School, Washington, D. C.; LL.B. 1911.

Professional: Practiced Title Law in Washington until 1917.

Aeronautical Activities: Flying Cadet with R. A. F. in Canada; assigned to 12th Aero Squadron as Pilot, April 1918; active war flying until July 1919; shot down and wounded in battle with enemy Fokkers near Chateau Thierry.

Flying Rating: Reserve Military Aviator, Dec. 1917; Airplane Pilot.

War Honors: Croix de Guerre with palm.

Member: Aero Club of America.

Present Occupation: 1st Lieut., U. S. Army, C. O. 10th Observation Squadron.

Address: Bolling Field, Anacostia, D. C.

Edward Peck Curtis

CURTIS, EDWARD PECK, Manufacturer; born, Rochester, N. Y., Jan. 14, 1897; son of Gurney Curtis and Alice Farley (Peck) Curtis.

Educated: St. Georges School, Newport, R. I.; Williams College.

Professional: Went to Baltic Provinces with U. S. Commission, June 1919 for a year; since that has been connected with the Eastman Kodak Co.

Aeronautical Activities: Trained in France; flew in 95th Squadron from Jan. 1918 to Armistice; American Ace, officially credited with destruction of six enemy planes.

Flying Rating: Junior Military Aviator.

War Service: French ambulance, Jan. 1917 to Aug. 1917; U. S. Air Service, Sept. 1917 to June 1919.

War Honors: French Croix de Guerre; American Distinguished Service Cross; Russian Order of St. Anne; two citations: "For extraordinary services in action, ———, France." "Lieut. Curtis volunteered to perform a reconnaissance patrol of particular danger and importance within the enemy territory. He made the entire journey through heavy anti-aircraft and machine gun fire and flew at an extremely low altitude to secure the desired information." "For exceptional gallantry at Woel, Belgium, on Sept. 14, 1918 in the operation of the A. E. F."

Member: Aero Club of America; Country Club of Rochester.

Present Occupation: Eastman Kodak Co.

Address: 343 State St.; home, 8 N. Goodman St., Rochester, N. Y.

John William Benton

BENTON, JOHN WILLIAM, 1st Lieut., U. S. A.; born, Manton, Calif., Nov. 27, 1897; son of Thomas Hart Benton and Kate (Lennon) Benton; married, Zelma Alice Carroll, Aug. 8, 1917.
Educated: Redding Grammar Schools; Redding High School; A.B. 1917, University of California.
Professional: Lumberman; aviator.
Aeronautical Activities: Pursuit course, Rockwell Field, Aug. 1918; instructor, pursuit course, Oct. 1918 to Feb. 1919; civilian aviator for R. G. Fowler Airway Development Co., Walter Varney, Bristol Demonstrator, Pacific Coast; U. S. Army Sept. 1920; instructor, March Field, to Feb. 1921; Kelly Field Pursuit.
Flying Rating: Reserve Military Aviator, April 28, 1918; Airplane Pilot.
Member: Pacific Aero Club.
Present Occupation: 1st Lieut., U. S. Army.
Address: 1250 Pine St., San Francisco, Calif.

Edward M. Morris

MORRIS, EDWARD M., 1st Lieut., Air Service; born, Marinette, Wis., Dec. 21, 1895.
Educated: Public schools, New York, N. Y.; Stuyvesant High School, New York, N. Y.; B. S. 1917, College of the City of New York.
Professional: Statistician, Metropolitan Life Insurance Co., New York, N. Y., Feb. 1917 to Aug. 1917; rancher, May 1919 to Sept. 1920.
Aeronautical Activities: Trained with R.F.C. in Toronto, Canada, Oct. and Nov. 1917, Fort Worth, Nov. 1917 to Feb. 1918; 139th Squadron, Feb. 1918 (overseas, Feb. 26, 1918) to April 1918; 12th A. S., April to July 1918; 2nd A. I. C., France, July and Aug. 1918; 104th A. S., Sept. 1918 to Jan. 1919; at March Field, Nov. 1920 to April 1921; Langley Field, April 1921 to date.
Flying Rating: Reserve Military Aviator, Jan. 28, 1918; Airplane Pilot, Feb. 25, 1921.
War Service: As above.
War Honors: Distinguished Service Cross.
Member: Aero Club of America.
Present Occupation: 1st Lieut., Air Service.
Address: Langley Field, Hampton, Va.; home, 25 Convent Ave., New York, N. Y.

Leslie P. Arnold

ARNOLD, LESLIE P., 1st Lieut., Air Service; born, New Haven, Conn., Aug. 28, 1893; son of Frank L. Arnold and Cora L. Arnold.
Educated: Public schools of Connecticut.
Professional: Submarine designer, 1914-1917.
Aeronautical Activities: Trained in U. S.; course at Issoudun, France; Army Occupation with 1st Aero Squadron until July 1919; testing at Aberdeen Proving Ground, Md., 1920; ferrying Martin Bombers, Cleveland to Langley Field, 1921.
Flying Rating: Airplane Pilot, April 26, 1918.
Present Occupation: 1st Lieut., Air Service.
Address: 19 Brooks Street, New London, Conn.

Carlton Foster Bond

BOND, CARLTON FOSTER, 1st Lieut., Air Service; born, Chicago, Ill., July 27, 1893; son of H. N. Bond and Anna M. Bond.
Educated: Public schools of Berkeley, Calif.
Aeronautical Activities: U. S. Air Service, Feb. 8, 1918 to date.
Flying Rating: Free Balloon Pilot No. 863; Airplane Pilot, March 25, 1920; Balloon Observer, July 17, 1918; Airship Pilot.
Present Occupation: 1st Lieut., Air Service.
Address: Langley Field, Va.; home, 2311 Bowditch St., Berkeley, Calif.

Lionel H. Dunlap

DUNLAP, LIONEL H., 1st Lieut., Air Service; born, Mt. Pleasant, Mich., June 28, 1894; son of Henry C. Dunlap and Mary Dunlap; married, Ethel Margaret Metcalfe, May 14, 1921.
Educated: Central Normal Training School, Mt. Pleasant, Mich.; Mt. Pleasant High School; Central Normal of Michigan; Western State Normal of Michigan.
Professional: Taught manual training, mechanical drawing and coached athletics in the Ionia Michigan High and Public Schools; worked as designer for the Packard Motor Co. of Detroit.
Aeronautical Activities: Ground School, Wilbur Wright Flying Field, 1917 for flying training; commissioned and acted as an instructor in bombing; transferred to the Gunnery School at Tallaferro Field, after completing the course, acted as instructor in aerial gunnery; overseas to school at Clermont Ferrand, France for further instruction in bombing; transferred to the 96th Aero Squadron, Maulan Petite, France; Feb. 1920, assigned to the 14th Squadron for bombing tests.
Flying Rating: Reserve Military Aviator, April 23, 1918; Airplane Pilot.
War Service: As above.
Member: Aero Club of America.
Present Occupation: 1st Lieut., Air Service.
Address: Lansing, Mich.

Benton A. Doyle

DOYLE, BENTON A., Captain, Air Service; born, St. Louis, Mo., Feb. 27, 1886; son of Maj. M. A. Doyle and Sophie M. Doyle; married, Myra L. Greenway, May 14, 1913.
Educated: St. Louis University; Georgetown, University.
Professional: Western Manager, Frankfort General Insurance Co.
Aeronautical Activities: Training at Post Field and Barron Field.
Flying Rating: Aerial Observer, May 1918; Airplane Pilot, Jan. 1919.
Present Occupation: Captain, Air Service.
Address: 709 Crocker Bldg., San Francisco, Calif.

Washington F. A. McIntyre

McINTYRE, WASHINGTON, F. A., Rancher; born, Olean, N. Y., March 6, 1893; son of Joseph McIntyre and Justina (Anderson) McIntyre.
Educated: Grammar and high schools; B.S. in Metallurgy, 1914, University of California.
Professional: Metallurgy, 1915-1916; ranching in Southern California, 1916 to date.
Aeronautical Activities: Training at March Field, 1918-1919.
Flying Rating: Reserve Military Aviator, March 1919.
War Service: As above.
Member: Allied Fliers Club, Oakland, Calif.
Present Occupation: Rancher.
Address: Thermal, Calif.

Edwin R. McReynolds

McREYNOLDS, EDWIN R., 1st Lieut., Air Service; born, Reasnor, Jasper Co., Iowa, July 3, 1893; son of Frances E. McReynolds and Minnie M. McReynolds.
Educated: Monroe public and high schools.
Professional: Telephone business, 1910 to 1916; salesman, 1916 to 1917; automobile business, Jan. to Nov. 1917.
Aeronautical Activities: Cornell Ground School, March 1, 1918 to May 10, 1918; primary training from June 1, 1918 to Oct. 6, 1918 at Carlstrom and Dorr Fields and Barron Field; commissioned 2nd Lieut., Oct. 8, 1918; student officer at Post Field, Oct. 23, 1918 to Dec. 23, 1918; Engineering Department to Oct. 23, 1919; Mexican Border, 8th Aero Squadron to July 15, 1920; A.S.M.S., Kelly Field to Sept. 1, 1920; May 15, 1921 to present at Langley Field.
Flying Rating: Reserve Military Aviator, Oct. 8, 1918; Airplane Pilot, Oct. 1919.
Present Occupation: 1st Lieut., Air Service.
Address: Langley Field, Va.; home, Newton, Iowa.

James Thomas Curry, Jr.

CURRY, JAMES THOMAS, JR., 1st Lieut., Air Service; born, McMinnville, Tenn., Jan. 7, 1892; son of James Thomas Curry and Mary E. (Moffat) Curry.
Educated: Webb School, Bell Buckle, Tenn.; one year, Southwestern University, Georgetown, Tex.
Professional: 1912-1917, General ranching in California.
Aeronautical Activities: Sept. 22 to Nov. 19, 1917, Ground School, Austin, Tex.; Jan. 1, to March 2, 1918, flying cadet at Kelly Field; April 4, 1918 to Oct. 4, 1918, flying instructor, Barron Field; Oct. 4 to June 20, 1919, advanced training at Ellington Field.
Flying Rating: Reserve Military Aviator, March 2, 1918.
War Service: U. S. Air Service from Sept. 22, 1917 to date.
Present Occupation: 1st Lieut., Air Service.
Address: 876 Waco Ave., San Antonio, Tex.

Roman John Steichen

STEICHEN, ROMAN JOHN, Salesman; born, Perham, Minn., Dec. 22, 1895; son of John Steichen.
Educated: St. Benedict's Academy, St. Joseph, Minn.; high school at St. Johns, Collegeville, Minn., 1909-1913; St. Johns University, 1913-1914.
Professional: 1915-1917, bookkeeper; army Aug. 1917 to May 1919; bond salesman, Feb. 1920 to present.
Aeronautical Activities: Aug. 1917, athletic director, 70th Aero Squadron, San Antonio, Tex.; Dec. 1917, on detached service with Royal Flying Corps, University at Toronto for purpose of studying Aerial Gunnery; Feb. 1918, instructor in Aerial Gunnery at Ellington Field also instructor at the Bombers Aerial Gunnery School at San Leon, Tex.; U. S. School of Military Aeronautics at the University of California, Oct. 1918 to Feb. 1919.
Flying Rating: Reserve Military Aviator, May 1919.
Present Occupation: Bond salesman.
Address: 529 Second Avenue South; home, 428 S. 8th Street, Minneapolis, Minn.

Robert Halbert Finley

FINLEY, ROBERT HALBERT, 1st Lieut., Air Service; born, Omaha, Nebr., Nov. 10, 1892; son of Robert Arnot Finley and May (Halbert) Finley; married, Irene Shepard, Sept. 14, 1914.
Educated: Public schools of Omaha, Nebr.; B.S. in Electrical Engineering, Nebraska University.
Professional: Sales Department, Ford Motor Co., Omaha, Nebr. until entered the service in Oct. 1917.
Aeronautical Activities: U. S. Army Balloon School, Ft. Omaha, Nebr., Oct. and Nov. 1917; cadet at ground school, balloons; U. S. Army Balloon School, San Antonio, Tex., Dec. 1917; Naval Air Station, Pensacola, Fla., Feb. 1919 to June 1919; Army Air Station, Langley Field, Va., June 1919 to present date; instructor in army airship school, Airship Communications Officer.
Flying Rating: Free Balloon Pilot No. 323, Jan. 30, 1918; Dirigible Balloon Pilot No. 122, Aug. 13, 1919; Balloon Observer; Airship Pilot.
War Service: Oct. 1917 to Nov. 1918.
Member: Aero Club of America.
Present Occupation: 1st Lieut., Air Service.
Address: Langley Field, Va.; home, 2603 Fowler Ave., Omaha, Nebr.

Peter Emanuel Skanse

SKANSE, PETER EMANUEL, 1st Lieut., Air Service; born, Seattle, Wash., May 13, 1893; son of Peter Skanse and Mia Skanse.
Educated: Washington Grammar School, Minneapolis, Minn.; Minneapolis South High School; University of Minnesota; Law School, University of Minnesota.
Aeronautical Activities: Enlisted, S.E.R.C., A.S. at Officers Training Camp, Ft. Snelling, Minn., Aug. 15, 1917; graduated from Ground School, University of Texas, Feb. 9, 1918; flying training at Kelly Field and Eberts Field; flying instructor at Eberts Field, May 16, 1918 to Oct. 12, 1918; flying instructor at Kelly Field, March 1919 to Sept. 1919; Mexican Border Potrol with 8th Aero Squadron at McAllen, Tex., Nov. 1919 to March 1920; Mexican Border Patrol and Squadron Engineer Officer, July 1920 to April 1921; attached to 1st Surveillance Squadron at Langley Field, May 1921 to date.
Flying Rating: Reserve Military Aviator, May 13, 1918; Airplane Pilot.
War Service: May 12, 1917 to date.
Present Occupation: 1st Lieut., Air Service.
Address: 1130 South Seventh Street, Minneapolis, Minn.

Guy Kirksey

KIRKSEY, GUY, 1st Lieut., Air Service; born, Dallas, Tex., Aug. 2, 1886; son of John. G. Kirksey and Mozelle (Perry) Kirksey; married, Hallie Overall Keys, May 26, 1921.
Educated: Grade schools; high school; LL.B. 1909, University of Missouri.
Professional: Lawyer, 1915-1917.
Aeronautical Activities: Cadet, Dec. 1917; commissioned 2nd Lieut., Air Service, Aug. 1918; instructor of flying, Brooks Field, Aug. and Sept. 1918; flying instructor, Park Field, Oct. 1918 to March 1919; Flight Commander, Carlstrom Field, March 1919 to Jan. 1921; at present, Pilot Martin Bomber, Langley Field, Va.
Flying Rating: Reserve Military Aviator, Aug. 1918; Airplane Pilot, 1920.
War Service: As above; all war service in U. S.
Present Occupation: 1st Lieut., Air Service.
Address: Langley Field, Hampton, Va.

Raymond Chapman Pierce

PIERCE, RAYMOND CHAPMAN, Consulting Engineer; born, Hornell, N. Y., May 19, 1887; son of William O. Pierce and Sadie (Chapman) Pierce; married, Leona Ruth Hunter, June 5, 1918.
Educated: Hornell High School; B.S. in M.E. 1909, University of Pennsylvania.
Professional: Mechanical Engineer from 1909 with Field Force Pump Co., Erie R.R. Co. and Linde Air Products Co.; commissioned Captain, S.R.C.A.S., Oct. 8, 1917 and ordered to Fort Omaha; invented Pierce Inflation Device for filling balloons, Pierce Flash Gun for training aerial observers, Pierce Propaganda Device for distributing propaganda from spherical balloons; designed hydrogen generating and compressing railroad car; Officer in charge of hydrogen plant until Feb. 1919; ordered to Akron, Ohio for work with dirigibles and in May to Langley Field as Officer in Charge of Hydrogen Plant.
Aeronautical Activities: Flying training, spherical ballons, Caquot, spherical and dirigibles in connection with experimental and testing work.
Flying Rating: Balloon Pilot.
War Service: Oct. 1917 to July 1919.
Member: Society of Mechanical Engineers.
Present Occupation: Consulting Engineer.
Address: 30 East 42nd Street; home, 472 West 144th Street, New York, N. Y.

Naval Air Legislation

Particulars of the final appropriations for the fiscal year ending June 30, 1922 are now available together with the details of the Bureau of Aeronautics that the bill establishes. The appropriations are as follows:

For aircraft and accessories in course of construction or manufacture on June 30, 1921, $440,000; for new construction and procurement of aircraft and equipment, $5,323,000; for navigational, photographic, and aerological equipment, including repairs thereto, for use with aircraft built or building on June 30, 1921, $49,250; for maintenance, repair, and operation of aircraft factory, helium plant, air stations, fleet activities, testing laboratories, and for overhauling of planes, $4,534,181; for continuing experiments and development work on all types of aircraft, $1,615,000; for drafting, clerical, inspection, and messenger service for aircraft stations, $275,000; new construction, buildings, and improvements at air stations at a total cost not to exceed $1,177,000, as follows: Coco Solo, $392,000; Hampton Roads, $70,000; Lakehurst, $280,000; Pearl Harbor, $185,000; Pensacola, $100,000; San Diego, $150,000; in all, $13,413,431, and the money herein specifically appropriated for "Aviation" shall be disbursed and accounted for in accordance with existing laws as "Aviation" and for that purpose shall constitute one fund: *Provided further,* That the Secretary of the Navy is hereby authorized to consider, ascertain, adjust, determine, and pay out of this appropriation the amounts due on claims for damages which have occured or may occur to private property growing out of the operations of naval aircraft, where such claim does not exceed the sum of $250: *Provided further,* That all claims adjusted under this authority during any fiscal year shall be reported in detail to the Congress by the Secretary of the Navy: *Provided,* That no part of this appropriation shall be expended for maintenance of more than six heavier-than-air stations on the coasts of the continental United States: *Provided further,* That no part of this appropriation shall be used for the construction of a factory for the manufacture of airplanes.

The section organizing the Bureau of Aeronautics is as follows:

That there is hereby created and established in the Department of the Navy a Bureau of Aeronautics, which shall be charged with matters pertaining to naval aeronautics as may be prescribed by the Secretary of the Navy, and all of the duties of said bureau shall be performed under the authority of the Secretary of the Navy, and its orders shall be considered as emanating from him, and shall have full force and effect as such.

There shall be a Chief of the Bureau of Aeronautics, appointed by the President, by and with the advice and consent of the Senate, from among the officers of the active list of the Navy or Marine Corps who shall within one year after his appointment qualify as an aircraft pilot or observer, for a period of four years, and who shall, while holding such position, have the corresponding rank and receive the same pay and allowances as are now or may hereafter be prescribed by or in pursuance of law for chiefs of bureaus of the Department of the Navy.

An officer of the active list of the Navy, or Marine Corps, may be detailed as Assistant Chief of the Bureau of Aeronautics, and such officer shall receive the highest pay of his grade, and, in case of the death, resignation, absence, or sickness of the chief of the bureau shall, until otherwise directed by the President, as provided by section 179 of the Revised Statutes, perform the duties of such chief until his successor is appointed or such absence or sickness shall cease.

There shall be a chief clerk at a salary of $2,250 per annum.

The Secretary of the Navy is authorized to transfer to the Bureau of Aeronautics such number of the civilian, technical, clerical, and messenger personnel, together with such records, equipment, and facilities now assigned for aeronautic work under the various bureaus of the Department of the Navy or Marine Corps as in his judgment may be necessary. The unexpended and unobligated portion of all moneys heretofore appropriated for any bureau of the Department of the Navy or Marine Corps used in connection with aeronautics, including the appropriation "Aviation, Navy," is hereby made available for the use of the Bureau of Aeronautics.

The number of officers and enlisted men of the Navy and Marine Corps detailed to duty in aircraft and involving actual flying and to duties in connection with aircraft shall hereafter be in accordance with the requirements of Naval Aviation as determined by the Secretary of the Navy: *Provided,* That not to exceed 30 per centum of the officers in each grade below that of rear admiral who fail to qualify as aircraft pilots or as aircraft observers within one year after the date of their detail into the Bureau of Aeronautics shall be permitted to remain detailed in this bureau: *Provided further,* That flying units or detachments, with the exception of aircraft carriers or other vessels, shall in all cases be commanded by flying officers.

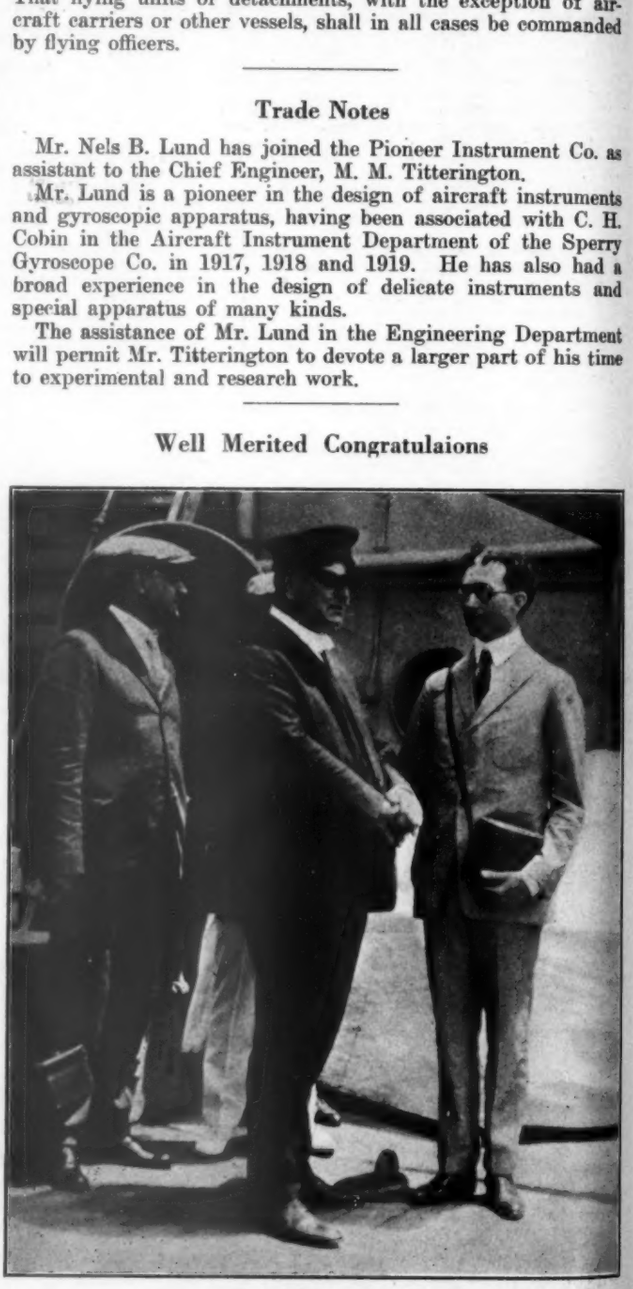
Trade Notes

Mr. Nels B. Lund has joined the Pioneer Instrument Co. as assistant to the Chief Engineer, M. M. Titterington.

Mr. Lund is a pioneer in the design of aircraft instruments and gyroscopic apparatus, having been associated with C. H. Cobin in the Aircraft Instrument Department of the Sperry Gyroscope Co. in 1917, 1918 and 1919. He has also had a broad experience in the design of delicate instruments and special apparatus of many kinds.

The assistance of Mr. Lund in the Engineering Department will permit Mr. Titterington to devote a larger part of his time to experimental and research work.

Well Merited Congratulaions



SEC. DENBY CONGRATULATES GLENN L. MARTIN ON SUCCESS OF MARTIN BOMBERS

Waterman Type O X-5 Racing Monoplane

This machine was designed and built for racing purposes and therefore only three factors were taken into consideration. These are: maximum speed with a stock O X-5 engine, good visibility, and maneuverability on the sharp turns. The resultant design is therefore not one of beauty or graceful lines. Neither does it embody low landing speed or fast climb.

In order completely to stream-line the required engine it has been necessary to build a fuselage of larger proportions. This has been found a very desirable feature as the large keel surface area has proven to be indispensible in making sharp turns at high speed. Below are the general specifications of the machine:

Specifications

Engine, Curtiss O X-5, 90 hp.
Weight empty, 885 lb.
Useful load, Pilot, 10 gal. gasoline, 12 qt. oil,—245 lb.
Maximum Speed, 130 m.p.h.
Landing " , 60 "
Cruising " , 110 "
Wing loading, 11.1 lb./sq. ft.
Power loading, 12.5 lb./hp.
Span, 21 ft. 9 in.
Chord, 66 in.
Total lifting area, 112 sq. ft.
Wing curve, U. S. A. 15
Stagger and Sweep back, none
Rudder Area, 5 sq. ft.
Fin " , 1½ " "
Aileron " , 16 " "
Elevator " , 10 " "
Hor.Stabilizer 12 " "

Weights

Fuselage complete with tanks, seat, controls, instruments & accessories	224 lb.
Motor complete with propeller	405 "
Radiator	23 "
Water	28 "
Tail surfaces	35 "
Wings, struts, ailerons, etc.	115 "
Landing gear	55 "
Total weight empty	885 lb.

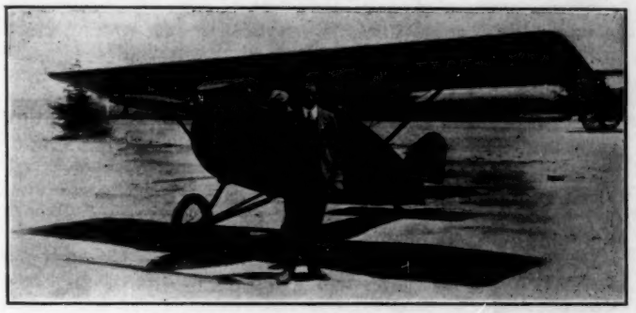
Fuselage The fuselage is of orthodox longeron bulkhead and plywood construction. There are six bulkheads of fir varying from ⅝ in. 6 ply to ⅞ in. 9 ply. These are spaced approximately evenly from the front of the engine sills to the rudder post. The maximum cross-section of the fuselage occurs just aft of the motor and is 31 in. by 39½ in. The longerons are 1⅛ in. square at the point of maximum depth and taper to ⅞ in. square at the rudder post. They are unspliced spruce. The veneer facing is 3 ply, 3/20 in. basswood and birch. Instead of tapering to a knife edge at the rudder post the fuse'age ends abruptly with a square cross section of 12 in. by 12 in. At this point there is attached an aluminum fairing 16 in. long.

Wings The wings are built up in standard web and cap strip construction with box spans. They are hinged to a tubular pylon at their roots and are supported at a point 72 in. from the root by tubular struts from the lower longerons. Single drift and anti drift Hartshorne wires are used on each side. These wires take practically all the tension load while the struts merely take the compression load. The box spars are unusually heavy especially at their point of intersection with the overhang struts.

Landing Gear Steel tube is used throughout the construction of the under carriage which is rigid. The struts are hinged to suitable fittings at the bottom longeron. As there are no shock absorbers, an exceedingly light and simple gear has been obtained, but not one which would be highly recommended for landing on rough ground. Cross-wires have been replaced by a diagonal tube carrying both tension and compression. The whole gear has been stream-lined with wooden fairing, wrapped with tape, and doped. Wheels and tires 26 in. by 3 in. are used on 1½ in. axle.

Controls Both the rudder and elevator controls are enclosed in the fairing at the rear of the fuselage and are operated through a system of staggared cranks and cables. This makes is possible to eliminate external control wires and masts in the tail unit. The ailerons are operated by a system of rods and bell-cranks, all of which are enclosed except for a short horn on each aileron. The leading edges of all control surfaces are rounded and set into recesses in such a way that there is no gap between the surface and the member to which it is hinged.

Motor Installation The motor is completely cowled in. A gravity fuel system with a 20 in. head eliminates bother of the usual pressure systems. A large door in the rear of the aluminum fire wall gives access to the carburetor for adjustments and cleaning. A small window in the side of the fuselage permits the inspection of the oil gage in the side of the crank case. The cooling system consists of one radiator placed on the star board side about 9 in. aft of the rear cylinder. In so placing the radiator the pressure caused by its being off center compensates for the propeller torque and eliminates the usual right rudder while flying a straight course. A propeller 7 ft. 9 in. in diameter with a 7 ft. pitch to which is fastened a small aluminum spinner is used.



WATERMAN MODEL OX RACING AIRPLANE, W. D. WATERMAN STANDING BESIDE IT

The machine is for the Mercury Aviation Co. and has been finished in their colors of Mercury red and black which gives it an exceedingly pleasing appearance in the air.

Courses in Aeronautics

Following is printed a list, revised as of June 23, of colleges, Universities and Schools of the United States offering practical or theoretical, partial or complete courses in aeronautics.

Polytechnic Institute, Brooklyn, N. Y.
Castle Girls School (Summer class only), Tarrytown-on-Hudson, N. Y.
Columbia University (2 hrs. wk. only), New York.
Culver Military Academy, Culver, Ind.
California Institute of Technology, Pasadena, Colif.
Kansas State Agriculture College, Manhatten, Kansas.
Massachusetts Institute of Technology, Boston, Mass.
University of Michigan, Ann Arbor, Mich.
N. Y. School of Aeronautics, Box 106, Grand Central P. O. New York.
Purdue University, Lafayette, Ind.
Stanford University, Stanford University, Calif.
University of Southern Minnesota College of Engineering, Austin, Minn.
State College of Washington, Pullman, Washington.
University of Washington, Seattle, Wash.
University of Illinois, Urbana, Ill.
Worcester Polytechnic Institute (lectures only), Worcester, Mass.
University of Detroit, Detroit, Mich.

Courses Contemplated

Georgia School of Technology, Atlanta, Ga.

Recovering the Pearson Plane

A very interesting report has just been received reciting the details connected with the expedition across the Mexican Border to recover the airplane abandoned by Lieut. Alexander Pearson in February last when, flying from El Paso to San Antonio, he was compelled to make a forced landing in a canyon south of the Rio Grande River, due to motor trouble.

The expedition proved to be a success in every way and the machine was recovered. More remarkable, however, was the fact that, although it was exposed to the elements for several months, it was found to be in such condition that it was only necessary to install a new engine on the spot where it had landed to enable it to be flown back over the Rio Grande to United States territory. This expedition demonstrated what could be accomplished in the way of traversing unknown territory on a mission of this nature, or one similar to it, with airplanes from the home base serving as liaison.

Communication between the airplanes and the expedition was maintained by a system of ground panels devised prior to the start. The planes not only maintained efficient liaison between headquarters and the expedition, but on several occasions, when food and water were almost exhausted and pigeon messages had been sent asking relief, the aviators from the Sanderson Airdrome circled over the party, dropping water, rations and mail. The water was dropped in regulation canteens, placed in grain bags filled with hay, about a dozen to a bag. None of the canteens burst, despite the fact that one bag was dropped from an altitude of at least 1,000 ft. On the other hand, canned beans, hard tack, and jam, dropped from a lower altitude, opened up wide. The coffee and bread withstood the drop. A little experimenting along this line would no doubt develop a system of dropping articles from airplanes with no damage to the container or contents.

After Col. Sedgwick Rice, the Commanding Officer of Camp R. E. L. Michie, Del Rio, Texas, had made the necessary arrangements with Colonel Ramirez, Chief of Staff of the Piedras Negras District, Mexican Army, to allow the expedition to cross over the Rio Grande with the view to recovering the abandoned plane, Lieut. Col. Charles O. Thomas, Jr., Cavalry, was assigned the task of reconnoitering the road to the location of the plane and to determine the feasibility of reaching it with a truck.

On April 28th Colonel Thomas, with Mr. Barker of Del Rio, Texas, and Mr. King of La Parida, Coahuila, Mexico (acting as guides) Lieutenant Doolittle of the Air Service, and two Mexican guides, proceeded to Villa Acuna, Coahuila, Mexico, in three automobiles, and started over the Las Vacas-Zaragosa road to the abandoned plane. In the afternoon of the same day, Lieut. A. Dayton left the Del Rio airdrome to furnish liaison with the party. He met with a mishap, however, the crankshaft of his motor breaking, and he was forced to make a landing six miles west of El Mosco Tank, Coahuila, Mexico. Lieutenant Dayton and Private Horowitz, his observer, abandoned the plane and walked to a goat camp where they spent the night. The next morning they were discovered by Lieutenants Moore and Selzer who had been dispatched by airplane to locate them. These latter officers dropped a message to Colonel Thomas notifying him of the location of Lieutenant Dayton and Private Horowitz, and they were picked up by his party a few hours later. As was the case with the Pearson machine, a new engine was subsequently installed in the Dayton machine and it was flown safely back over the border.

On the morning of April 30th Colonel Thomas's party, which was then within three miles of the Pearson machine, ran short of water, and they communicated that fact by holding up a canteen when Lieutenant Stenseth was flying over them. A message was dropped by Sergeant Dorcy, the observer with Lieutenant Stenseth, stating that they would return to Sanderson and obtain same. Lieutenant Stenseth obtained 12 canteens of water and 50 lb. of ice at Sanderson and he, and Lieutenant Woodruff in another plane started back to Colonel Thomas's party. It was necessary to use undue haste owing to an approaching sorm. The water and ice were delivered, but the pilots experienced considerable difficulty in returning to Sanderson, being forced to fly through a severe electrical storm which overtook them.

On the morning of May 1st Capt. N. R. Atwell, with a pack train, escort, and a supply train, the whole comprising 22 men, 106 animals, 5 escort wagons, one light wagon and two water carts, with one enlisted man of the Signal Corps carrying 15 pigeons for liaison work, proceeded to join Colonel Thomas and continue under his direction. The party was accompanied by Mr. Barger and Mr. Shiverick, acting as guides, and carried rations for 15 days.

Lieutenant Doolittle returned to Del Rio by automobile on May 3rd, stating that he had inspected the Pearson machine and that it was perfectly feasible to reach it by truck, install a new engine in it and fly it back. Accordingly, the next morning, accompanied by four mechanics, he was sent back with a light truck and another engine, and reached Colonel Thomas in the evening.

It was decided to repair the Dayton machine first, and, on the morning of May 6th Lieutenants Doolittle and Moore with their detail of mechanics proceeded with the work of installing a new engine in this plane. The next morning the entire detachment turned out to clear a field for Lieutenant Moore to take off from. At 11:00 a.m., everything having been carefully inspected and tested, Lieutenant Moore with an observer took off in the Dayton machine, circled over the party several times, and then turned due east, landing safely at the Del Rio Airdrome about an hour later. There being no need for the wagon train, Captain Atwell was instructed to return to Del Rio, taking with him the old engine from the Dayton machine, and the remainder of the party started off for the Pearson machine.

Considerable difficulty was experienced en route, the sand, gravel and large boulders making it troublesome for wheel transportation. All difficulties were overcome, however, and the party arrived at the Pearson machine on the morning of May 8th. Work was immediately started on taking out the old engine and installing a new one. Those not working on this job began clearing a field for Lieutenant Doolittle to rise from. A space more than 400 yd. long and 100 yd. wide was cleared. Every bush, soto stalk, Spanish dagger and Lechequilla plant was cut below the ground and then a drag made of the timbers, which had been brought along for use in lifting the engines into place, hung behind the G. M. C. truck, and the field made level.

Colonel Thomas, in commenting on Lieutenant Doolittle's feat of flying back the Pearson plane, stated:

"Simply to fly this plane out from where it was was no feat for an aviator of Lieutenant Doolittle's ability, but to change the engine, putting in one that had been overhauled sometime before, and that in a machine that had come down under a forced landing and had been left in that dry country exposed to the hot sun for more than three months, even though every part was tested so far as we could out there, it took a lot of nerve, I say, to fly such a machine."

Being fresh from the same job at the Dayton machine, the mechanics stepped right along with the changing of the engine in the Pearson machine, and all was about ready for it to fly on the afternoon of May 9th, when trouble turned up in the oil pressure. After working with this for hours, going over every part of it, it looked as though matters would be delayed until a new pressure gauge could be secured. In order to lose no time, water being a factor, a message was sent by pigeon asking for two new pressure gauges. This message, sent by pigeon No. 2619, was the best work done by any of the pigeons. This pigeon, although cooped up in a basket for nine days, bumped over the roughest roads for 160 miles, and at that time 125 miles by air line from Del Rio, was given the message at 12:30 noon, May 9th, and it was delivered the same afternoon in time for Colonel Rice to get Lieutenant Harbeck at the Del Rio airdrome and send Lieutenant Moore in his plane to Sanderson before dark, ready to take the two oil pressure gauges to use the first thing in the morning of May 10th, or as soon as the fog would clear.

Colonel Thomas, in touching upon the work of the pigeons, stated that in his experience there is no limit to the time you can carry them in a basket cooped up, but when you take them out to start them on their way it is not advisable to rush them off. Put them down quietly in the shade, let them rest a little and walk around and go of their own accord. They will take from half to three-quarters of an hour before starting, but when they do start they are fresh and you can count on their delivering the message.

As events subsequently proved, it was unnecessary for Lieutenant Moore to start out from Sanderson to bring the gauges. The mechanics, after working on the oil line, finally took out the pump and upon examining it found the source of the trouble, a small washer having been left out of the pump. In short order a washer was taken out of the pump of the old motor and placed into the new one, and very soon the oil pressure came up.

Early in the morning of May 10th, the final arrangements were made for the start when the oil pressure again began to act badly—this time, however, from a different cause. The night had been very cool, causing the oil in the motor to congeal. After a delay of two hours, during which time the oil was taken out in buckets and warmed up, everything seemed to be in perfect order and at 7:50 a.m. Lieutenant Doolittle took off. His course in the canyon was due north over a range of mountains some 1500 ft. high. He had to gain this altitude in the first two miles. This he did, the machine rising over the first peak. In due time he arrived safely at the Del Rio Airdrome. Colonel Thomas and his party then started on their return journey, arived at Villa Acuna at 4:00 p.m., May 11th, where he was met by Colonel Rice, and by 5:30 p.m. all were across the Rio Grande and back in the States, bringing every part of the old engine from the Pearson machine.

In concluding his report, Colonel Thomas states:

"The services rendered by Mr. G. W. King as guide and interpreter were most valuable. His knowledge of the country made it possible for us to find a road through that rough country for sixty miles for even the heavily loaded trucks where wheel transportation had never been before.

"Sergeant Malkamas and his three assistant mechanics of the Air Service, gave the very best they had in them, and the safe flight of Lieutenant Doolittle demonstrated the efficiency of their work. To Lieutenant Doolittle I feel it is difficult to express in words the efficient manner in which he did his job."

Colonel Cooper's Escape from Russia

Col. Merion C. Cooper, of Jacksonville, Fla., who with Col. Cedric Fauntleroy organized the Kosciuszko Escadrille, which unit took a prominent part in the Polish-Russian war recently gave an interview to the Polish newspaper Rzeczpospolita. Colonel Cooper told in particular of his escape from Bolshevik captivitly. He said:

"My escape from Bolshevik captivity represents no merit of my own. My life and liberty are due to two Poles, members of the Polish Army, who were in Bolshevik captivity,—2nd Lt. St. Sokolowski, of the 31st Regiment of Infantry of the Army of Zeligowski; and Corporal of Polish Cavalry, St. Zaleski. They induced me to flee, accompanied me during my escape, and at the risk of their own lives, led me right through Russia.

"I first came to Poland in February 1919, when the Ukrainians were beseiging the city of Lwow. At that time, I was unable to fly because of an accident at the French front. In Lwow, therefore, I busied myself with food supplies, taking an active part in the American Food Mission. I returned to Paris in August, and, in conjunction with Colonel Fauntleroy, began to organize the Kosciuszko Escadrille.

Colonel Fauntleroy became interested in Poland and asked that we, as American officers, be sent to aid her. For political reasons, this was impossible; but since the Polish Government asked for aviation experts both of us entered the Polish service as Polish officers. Placing himself with his Escadrille at the disposal of the Chief-of-State, General Pilsudski, Colonel Fauntleroy made one condition—that we were to be sent to the front. Hence, during the attacks on Kiev, the squadron was active in Volhynia and the Ukraine, and finally in Kiev.

"On the 30th of July, I was shot down by Bolshevist machine guns and my airplane was wrecked. I was captured by some Cossacks, who treated me very badly. Then they handed me over to the Russian Commander, Budienny, who treated me well. I was sent to Moscow, to the prison of the Extraordinary Commission (Tchrezvychika)."

Colonel Cooper did not complain of his treatment while in Bolshevik prison. He said that the food was bad and insufficient. Only during three months when the Bolsheviks were conducting an intensive propaganda among Polish prisoners did he receive better food. Colonel Cooper's position was worse than that of the others because he was an American. His life was saved only by the fact that the Bolsheviks did not know his name. They were particularly angry with him and with Colonel Fauntleroy, not so much for fighting on the Polish side, as for conducting pro-Polish activities abroad. Their Intelligence Service had informed them of a number of lectures given by Colonel Fauntleroy on Poland during his brief stay in America. When Polish prisoners began to return and it became more and more difficult to conceal the identity of Colonel Cooper the two Poles, mentioned above, induced him to save his life by escape. This was accomplished on the 12th of April. The two Poles succeeded in getting Colonel Cooper out of prison and the three managed to escape the Bolsheviks guards. Then, all three of them started walking by day, as far as possible, through the woods, and keeping close to a railroad line. At dusk, they boarded freight trains and travelled by this means during the night. In this way, they travelled for 15 days, covering 225 miles by train, and 200 miles on foot. On their way, they were well treated by the peasants and it was not necessary to conceal the fact that they were prisoners. The rivers formed a grave danger because all bridges were in the hands of Bolshevik soldiers. Yet, the man accompanying Colonel Cooper managed to tell enough lies to get out of difficulties, and whenever he himself was addressed by the Bolsheviks, he would put his finger into his mouth and utter strange sounds, whereupon the Bolsheviks would declare, "Poor, dumb man, let him go".

"We crossed the frontier of Latvia as smugglers, this particular type of occupation being favored by the Bolsheviks, and in Riga the Polish Military Attache did for us all that was possible."

Mine Laying Airplanes

With the experimental work in the tactical use of aircraft, such as the making of smoke clouds to hide formations and manœuvers, the dropping of toxic gas bombs from aircraft, and the construction of airplane carrier ships, it may be expected that the Naval Air Service will conduct tests of harbor and inlet protection with mines laid from airplanes.

It would be an enormous task, and an expensive one in time and material, to cover any large area in this manner, but where there exists the combination of a limited period of time for the work and a small area to be covered airplane mine laying might reasonably be expected to be successful.

Little has been done along this line, though the Germans did successfully attempt the method on the Baltic Sea in 1917, using seaplanes of the float type, known as "torpedo" planes. These were two-engined machines using either 200 hp. Benz or 260 hp. Mercedes. The use of twin floats permitted the attachment of the mine, or torpedo, between them and under the fuselage. A release system was arranged so that the mine could be freed by the pilot. These airplanes were normally loaded with eight 110 lb. bombs or one torpedo.

In laying mines, the airplane was flown within ten to fifteen feet of the water, and the mines which weighed 880 lb. with an explosive charge of 440 lb. were released automatically anchored after sinking to a predetermined depth.

No experiments of this nature have been carried out from airships. Their use presents further opportunities for tests.

Paris Le Havre Service

Regular airplane service between Paris and Le Havre, a distance of 130 miles, has been established in order to carry passengers to and from Atlantic liners using this port.

Airdrome Notes

Moose Jaw, Sas. Ca.

A customs air harbor has been established at Lynbrook Heights addition to the city of Moose Jaw, in (approximately) 50° 24′ N., 10° 34′ W.; altitude, 1,865 feet above sea level, dimensions, 400 yards north and south and 700 yards east and west, licensed for use by day only and marked by a circle within a square divided in equal parts by a straight line.

Customs personnel will be on duty when notified at the collector of custom's office, Moose Jaw. Directional wind indicator on the western side of the airdrome, telephone connection and water supply. There are facilities for repair, fuel supply, and machine accomodation, and a handling party is stationed on the airdrome. Connection with the city by electric railway adjoining the airdrome and by good roads.

Operated by the Western Aeroplane Co. (Ltd.), of Moose Jaw, Saskatchewan.

Providence, R. I.

Hills Grove Aviation Field is located northward of Apponaug, about 6 miles southward of Providence, and about 200 yards eastward of the New York, New Haven & Hartford Railroad tracks.

There is a hangar on the field, about 60 by 150 feet, with regulation marker on the roof. There is also a half-mile race track on the field. The best part of the field to land on is between the race track and the road, running north and south. A sausage or flag on the hangar will indicate the direction of the wind.

There is a garage on the field that carries Bessemer aviation gas, etc. The field has been used by the Government for DeHaviland planes on several occasions.

Hartford, Conn.

It is reported that a high-voltage electric cable, supported on two high steel towers, crosses the Connecticut River a short distance northward of the municipal airdrome at Hartford. This obstacle may provide an element of danger for pilots who are not familiar with its location, especially with poor visibility.

Iowa City

The Airdrome of the Commercial Club is being provided with a radio station.

Wilkes-Barre, Pa.

Headquarters of the new Wilkes-Barre, Philadelphia, New York air line will be maintained at this city. A temporary airdrome is now in service at the Kelly Farm on the middle road, north of Nantichoke, and plans are under way for a permanent field.

Yorktown, Va.

Seaplanes landing at the airdrome here are advised that shoal water extends 300 yds. off the southern bank of the York River abreast the field. Landings should be made well off shore and planes taxied to the beach by way of the channel into the mouth of Felgates Creek. A line of stakes has been placed to mark the eastern edge of this channel. Machines should be beached as close as possible to the dock at the mouth of Felgate Creek, as the shoal referred to uncovers at low water.

Fuel, oil, and facilities for minor repairs are available. Large machines anchoring off the beach can obtain a motor dory by signaling to the dock.

Westport, Wash.

The new radio compress station recently placed in operation at Westport, Wash., was completely destroyed by fire on May 22, 1921. The date of reestablishment is indefinite.

Approx. position: 46 deg. 53 min. 19 sec. N., 124 deg. 07 min. 29 sec. W.

Newport, R. I.

The Newport Chamber of Commerce of Newport, R. I., is preparing to establish a flying boat station and is constructing ways and other facilities for visiting air yachts.

Rockaway, L. I., N. Y.

The naval air station at this place will be closed as soon after September 1 as is practicable in accordance with the economy campaign now in vogue.

San Francisco, Calif.

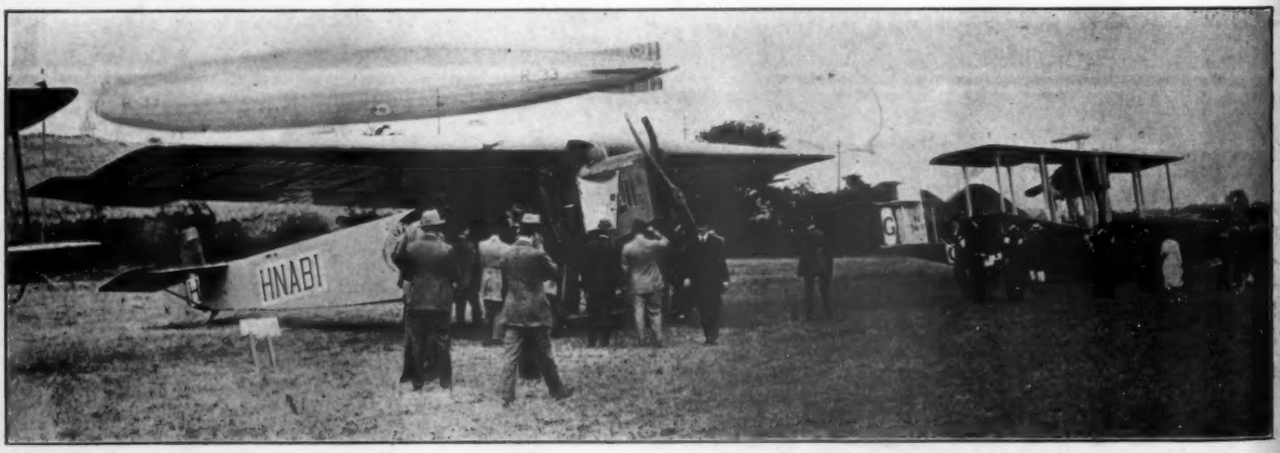
A second class red nun buoy, marked CF was established in 21 ft. of water to mark the submerged outer end of the army seaplane runway at Crissy Field, Fort Winfield Scott, on the bearings: Fort Point Light Station—282 deg. 30 min.; Lime Point Light Station—331 deg. 30 min.; Alcatraz Light Station— 64 deg. This buoy will be maintained by the War Department.

Bristol, Va.

The Bristol Aero Club has been organized and plans are being made for an airdrome.

Almirante, Panama

Quarantine regulations are in force at this port due to the outbreak of an epidemic, and all aircraft landing will be required to show a bill of health and comply with all the health regulations.



A View of Croydon Air Terminal, England, Showing The Vickers "Viking" Amphibian on the Right, the Fokker on the Left, and the R33 in the Background

The K. L. Fuel System

The fuel system described herewith was designed to overcome the troublesome features which have been common to most of the complex systems now in use and completely to meet the exacting requirements of airplane work. A study of the design indicates that these most desirable qualities have been well attained.

The designers have had many years experience with the various systems and have stated the essential requirements of any fuel system to be:

1. A positive method of supplying fuel to the carburetor before the engine is started.
2. After the engine is started, an ample supply of fuel at the carburetor, under practically constant pressure, and under all possible conditions of engine loading and flight positions of the plane.
3. Fuel must be clean.
4. System must be arranged to take fuel from two or more tanks. Sufficient tank capacity for any reasonable length of flight is usually in two or more tanks in present type machines.
5. The system should be able to operate correctly, no matter what the relative location of the fuel tanks and the parts of the system.
6. The piping, connections and fittings must be an absolute minimum and the whole pipe system should be as near trouble and leak-proof as is possible.
7. It is also desirable to have as little piping and as few pipe joints *under pressure* as is possible.

The solution of this important problem has resulted in the design described below, which is worthy of most careful consideration.

The whole system between the fuel tanks and the carburetor consists of but two major parts, viz; a hand pump and an engine-driven pump, with the connecting piping and strainer. A brief description of these two pumps will make the operation of the system apparent.

Engine-Driven Pump

A gear-type main fuel pump is arranged to be driven by the engine, Fig. 1 a practice now acknowledged to be the best, and thus the pump capacity is nearly in proportion to the fuel consumption. The capacity is, however, always in excess of the demand. All excess fuel delivered is lead from the discharge to the inlet side of the pump through a spring-loaded safety valve and passage contained in the pump body. The spring tension may be adjusted by an outside wheel and the dischage pressure regulated as desired. Such a return or relief system is usually made up of outside piping, but putting this in the pump body eliminates all outside piping and connections and so eliminates this source of leakage.

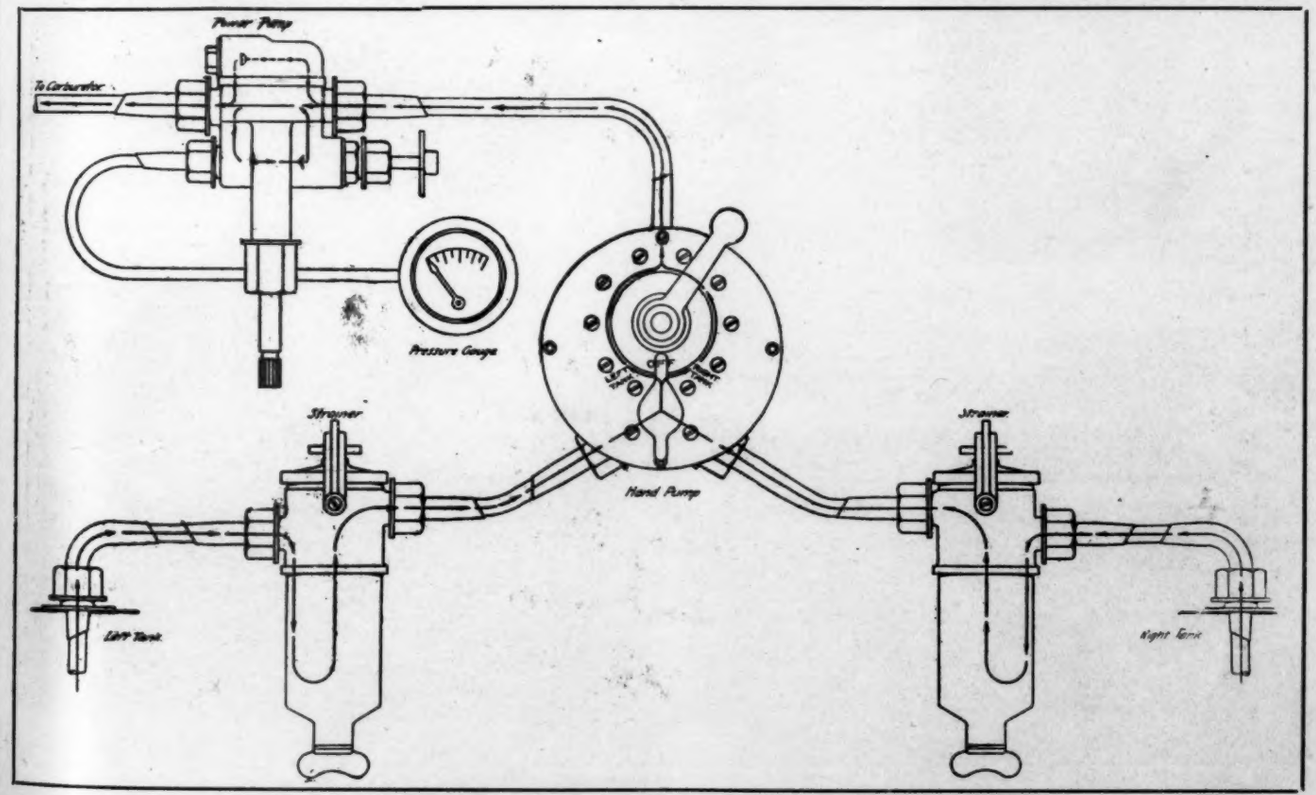
To provide a fine fuel delivered from the hand pump, a passage is machined in the cover plate of the power pump and provided with a check valve preventing flow in the opposite direction. By this construction, another line of outside pipe common to some systems is eliminated.

Since reliability is the prime essential, all working parts are purposely made with a factor of safety greater than any part of the engine or plane.

This, together with the use of the best obtainable materials and the highest quality of workmanship are relied upon to make this unit the most reliable element of the entire power plant. The body is of "non-gran" bronze and the gears are of chrome nickel steel. The gears are cut with a special form of tooth so that a free-running long-life pump is the very desirable product.

The view in Fig. 1 shows the pump mounted in a bracket carrying a spiral gear drive arranged for direct attachment to a Liberty-12 Engine. The smaller connection opposite the pressure adjusting wheel is for a tube to the pressure guage mounted upon the instrument board.

Ample stuffing boxes are provided around both the driving shaft and the spring-adjusting stem, but any leakage along the driving shaft is drawn back to the suction side of the pump through a hole drilled from the clearance space around the shaft to the inlet passage and any leakage around the adjusting stem consists of air into the system rather than fuel out.



THE LAY-OUT OF THE K. L. FUEL SYSTEM.

Hand Pump

This pump is of the so-called "wobble" or oscillating type, so successfully used abroad during the war and since. Figs. 2, 3, 4 and 5 show essential features of construction. Fuel enters through the two connections shown and passes through the combination two-way and shut-off valve, the extreme positions of which connect either tank and the mid position of which shuts off both lines entirely.

The plane suction valves in the lower valve plate Fig. 3 and the discharge valves in the oscillating plate, Fig. 4 permit fuel to pass freely through the pump when it is not in action as a pump and thus makes it, at such time, a part of the fuel flow line.

On the back of the pump is a fuel return passage leading fuel from the discharge to the suction side through a spring loaded safety valve. This makes it impossible, by a too vigorous operation, to build up excessive pressure which might damage the pressure guage or flood the carburetor in starting or in running.

Lock Unions

Every pipe connection in the entire system is a special extra-heavy ground-joint union locked in place, when made up, by a spring washer between the nut and shoulder on the male end. Provision for lock wires is also made and if further insurance against leakage is desired, all connections may be surrounded by rubber couplings. While provision has been made, in the past, for locking about all the fastenings of an airplane, it is believed that such important fastenings as pipe unions have not heretofore been locked.

Strainers

Believing that the strainers now in use were susceptible of improvement, a new design is supplied in order to prevent possible trouble from this simple but important element of the system Fig. 5 is an exterior view and Fig. 6 shows principal parts.

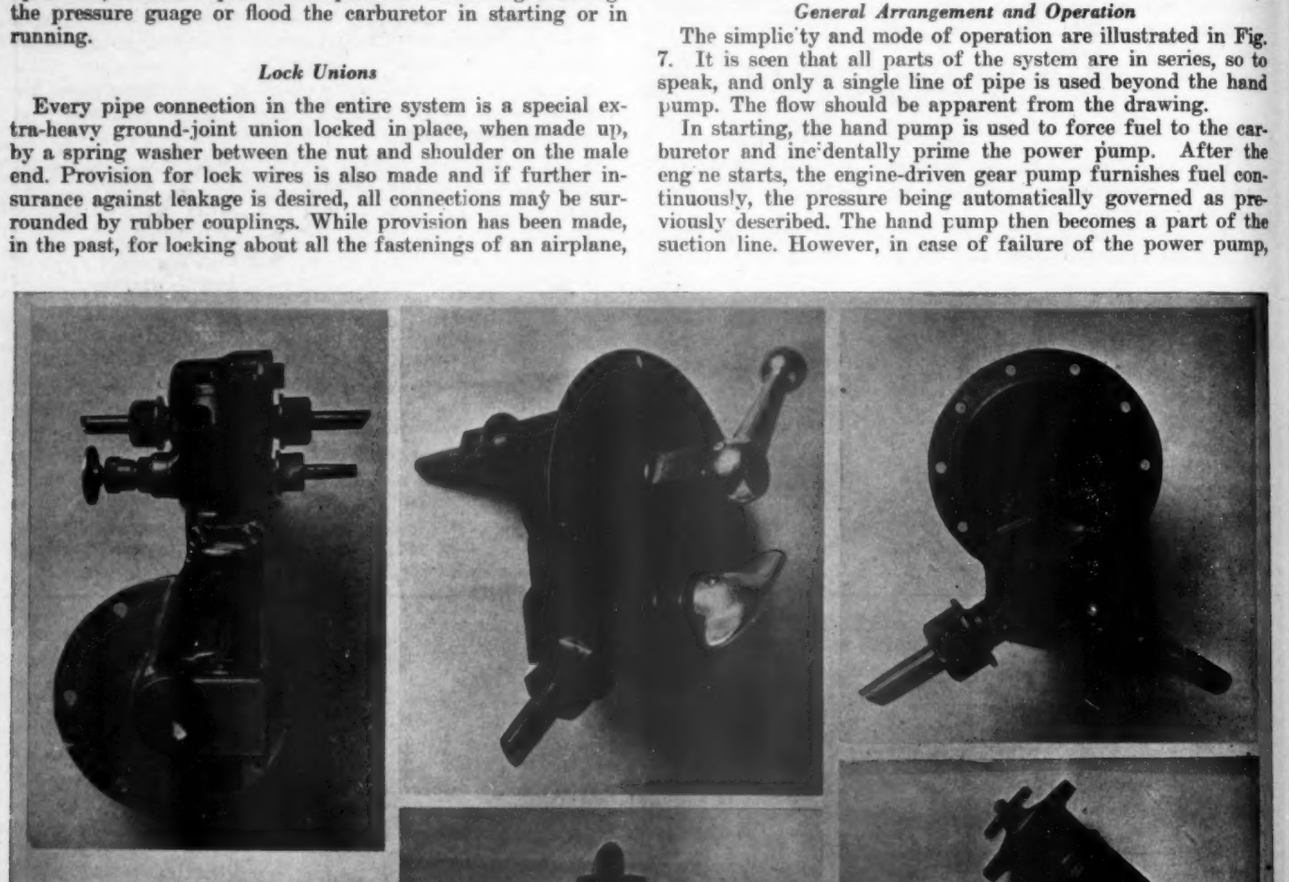
The fine-mesh straining surface is ample and easily removed for cleaning by releasing the nut and bale at the top. The plug at the bottom permits accumulated water or sediment to be easily drained. Both operations are accomplished without disconnecting any piping or disturbing the mounting. Locked spring-washer unions provide the pipe conections to this part as well as to all others.

The body is machined so that a strap support may be used, or the strainer may be supported on the square flange shown.

General Arrangement and Operation

The simplicity and mode of operation are illustrated in Fig. 7. It is seen that all parts of the system are in series, so to speak, and only a single line of pipe is used beyond the hand pump. The flow should be apparent from the drawing.

In starting, the hand pump is used to force fuel to the carburetor and incidentally prime the power pump. After the engine starts, the engine-driven gear pump furnishes fuel continuously, the pressure being automatically governed as previously described. The hand pump then becomes a part of the suction line. However, in case of failure of the power pump,



PARTS OF THE K.L. FUEL SYSTEM. NUMBERS 1 TO 6, READING FROM LEFT TO RIGHT, REFERRED TO IN THE ARTICLE.

the hand pump may be used continuously to furnish fuel to the carburetor.

It should require but little thought to see that the system described fulfills, almost ideally, every requirement enumerated at the start. Some very important features, which have been prolific sources of trouble in the past, are worth emphasizing. In the first place, the number of pipe connections and the amount of piping are reduced to a minimum. Secondly, in the normal operation, there is no pressure on any part of the system, except the line running from the discharge of the power pump to the carburetor and to the pressure guage and these short lines can be properly protected from leakage. The tendency on other parts of the system is for air leaks into rather than fuel leaks out. Third, the operation should be equally good and reliable, no matter what the relative elevations and locations of the main fuel tanks, parts of the system and the engine, thus permitting fuel tanks and other parts to be located where most convenient.

The power pump, the delivery line under pressure and the carburetor, by proper mounting, are integral parts of the engine and are thus free from liability to failure due to relative motion between the engine and plane as is common in most other systems.

While the power pump mounting and drive illustrated is for use on a Liberty Engine, suitable mounting and drive arrangements are being developed for use with all other standard aviation engines.

The entire system is being manufactured and sold by the K. L. Automotive Specialties Company, New York City.

British Civil Aviation

The British Air Ministry has issued its half yearly report on civil flying, from Oct. 1, 1920 to Mar. 31, 1921.—In consequence of the suspension of the British Continental Services, a small Committee was formed in February by the Secretary of State for Air to examine the whole question of granting financial assistance to firms operating on cross-Channel services As a result a daily service from London to Paris was re-opened on 19th March, 1921 by Messrs. Handley Page and the Instone Air Line; each firm being guaranteed 10 per cent profit on its receipts, with a maximum subsidy in each case of £25,000. The Committee is now considering a permanent scheme for the direct assistance of air services.

Whereas during the six months from April to September, 1920, British air traffic was about four times the foreign traffic, from the beginning of 1921 to the end of March it has been only about one-quarter of foreign traffic, the number of arrivals and departures of British aircraft to and from the continent having fallen from 1,997 to 644. During the period under review the machine mileage for civil aviation was 212,200 miles, the number of passengers carried 10,103 and the weight of goods 38 tons, as compared to 689,000 miles 32,345 passengers and 86½ tons for the previous six months. It is significant that the value of imports by air has only fallen from 1,376,606 to 1,305,831, and of exports from 1,168,300 to 1,167,731.

The licensing of air personnel and aerodromes and the registration of air craft have proceeded normally. Up to the 31st March, 1921, 617 pilots had been licensed and 635 heavier-than-air craft registered.

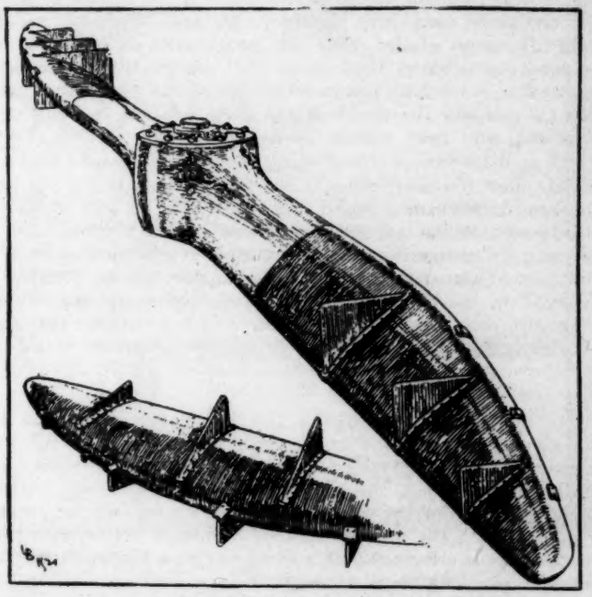
Medical examinations of civil pilots who have been engaged regularly on flying duty for a period of approximately 21 months indicate that the average physique of pilots regularly employed is satisfactory and that there is no deterioration as a result of constant work, but it is considered too early to ascertain whether further experience will produce similar results.

Investigations into the use of metals in the construction of aircraft are being continued and various new types of propellers have been tested, including variable pitch propellers, adjustable during flight, and propellers with metal hubs and detachable blades which can be set at any desired pitch before flight. In the development of engines special attention is being paid to direct fuel injection super-charging and engine starters.

It has been decided to hold an open competition, particulars of which will be published shortly.

New Type of Airplane Propeller

An Englishman by the name of Bourke has invented a new type of propeller which it is claimed will go a long way in lessening the noise and vibration caused by the existing type of airplane propeller. It is claimed by the inventor that his propeller by attaining the maximum of thrust will increase speed and at the same time require less engine power. Instead of being smooth, the blades of the propeller have a number of flanges made of aluminum raised about six inches, which run in parallel lines across the surface and work just as the teeth of a turbine. With the new propeller the wash of the wind from the blades drives in a steady flow instead of



BOURKE TURBINE PROPELLER.
(Courtesy "The Aeroplane")

striking the planes and struts in whirling gusts thereby increasing vibration. The grip of the serrated blades in the air is much greater, and therefore a much higher speed is obtained in taking off. It is understood that the Handley Page Co. contemplate making exhaustive tests of the new invention in the near future. One of the two well known pilots who have tried the new propeller privately are satisfied that it fulfills all the claims the inventor puts forth.

Italian Naval Aviation

In order to keep the air personnel of the Air Force in the best physical condition they will be required to undergo a physical examination at Naples one year from the date of enlistment to determine their fitness for flying. For the same reason, the air personnel will be subjected to occasional examination, i.e. after sickness or at the instance of commanding officers. The different Aeronautical Commands will arrange directly with the Medical Headquarters at Naples which will name the days for the examination and the number of officers and privates to be examined.

Medical Headquarters will communicate to the Ministry, Inspectorate of Aeronautics, the names of the men who are unfit for flying. Commanding officers in their monthly reports will give the names of the officers and privates sent for examination and the results of the same.

New Air Transport Concern

The Aerial Navigation & Engineering Co., with offices in the Foster Building, Denver, Colorado, has been organized for the purpose of operating an air line between Denver and Chicago, via Kansas City and St. Louis.

The organizers of the company are N. H. Steele, President, J. P. Skrdlant, Vice-President and General Manager, and R. S. Waugh, Secretary-Treasurer and Chief Engineer.

General Theory of the Steady Motion of an Airplane

Synopsis of N.A.C.A. Report No. 97

The writer points out briefly the history of the method proposed for the study of the steady motion of an airplane, which is different from other methods now used. M. Paul Painleve has shown how convenient the drag-lift curve was for the study of airplane steady motion. His treatment of this subject can be found in *Technique Aéronautique*, No. 1, Jan. 1, 1910. In the author's book "Etude de la Stabilite l'Aéroplane," Paris, 1911, he has added to the drag-lift curve the curve called the "speed curve" which permits a direct checking of the speed of the airplane under all flying conditions. But the speed curve was plotted in the same quadrant as the drag-lift curve. Later, with the progressive development of aeronautical science, and with the continually increasing knowledge concerning engines and propellers, the author was brought to add the three other quadrants to the original quadrant, and thus was obtained the steady motion chart which is described in detail in this report.

This chart therefore permits one to read directly for a given airplane its horizontal speed at any altitude, its rate of climb at any altitude ,its apparent inclination to the horizon at any moment, its ceiling, its propeller thrust, revolutions, efficiency and power absorbed, that is, the complete set of quantities involved in the subject, and to follow the variations of all quantities both for variable altitude and for variable throttle. The chart also permits one to follow the variation of all of the above quantities in flight as a function of the lift coefficient and of the speed.

The author also discusses in this report the interaction of the airplane and propeller through the slipstream and the question of the properties of the engine-propeller system and its dependence upon the properties of the engine considered alone and of the propeller considered alone will be found treated here in the general manner demanded by actual aeronautical engineering practice. There is also a discussion of the question of a standard atmosphere.

In Part IV the general theory of the steady motion of an airplane is developed, and after the basic equations have been established and the methods to be used described a general survey of the properties of airplane steady motion is given. A detailed discussion of climbing phenomena will be found and the general formulas established for the rate of climb and time of climb, which quantities under the simplest assumptions appear as hyperbolic functions of the ceiling.

A copy of Report No. 97 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

Washington Aero Engineers to Open New York Office

An agreement has just been effected between the firms of A. & D. R. Black, Washington, D. C., and Alexander Klemin and Associates, New York, by which the former will take over the offices at 22 East 17th Street, New York, to be vacated by the latter firm upon removal of its staff to the plant of the Cox-Klemin Aircraft Corporation, College Point, N. Y.

On account of the taking over of Mr. Klemin's organization by the Cox-Klemin Corporation certain classes of inquiries (particularly in the consulting field) which he will no longer be in a position to handle will be referred to A. & D. R. Black.

As a part of these changes the Black firm will remove its head office from Washington to 22 East 17th Street, New York, on August 15th. Its present office in the Evening Star Building, Washington, will be continued as a Washington branch.

Aerial Survey in Haiti

In the July 11 issue of AVIATION AND AIRCRAFT JOURNAL an article "Aviation in Haiti" stated that the survey of the coast line in that country was done by the Marine Corps Air Force for the U. S. Coast and Geodetic Survey.

We have since learned that this work was done by the Marine Corps Air Force for the U. S. Geological Survey—not the U. S. Coast and Geodetic Survey.

Where to Fly

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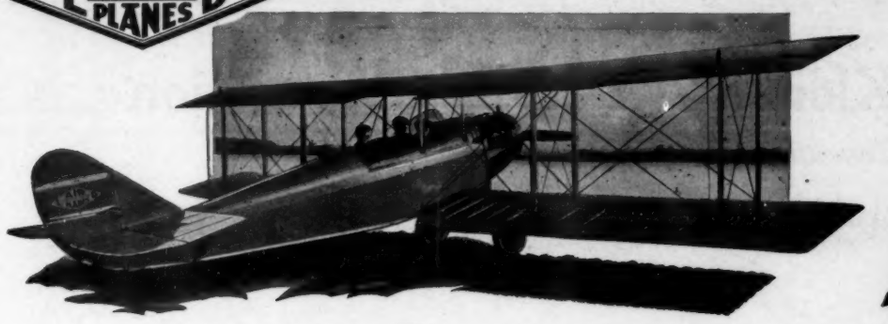

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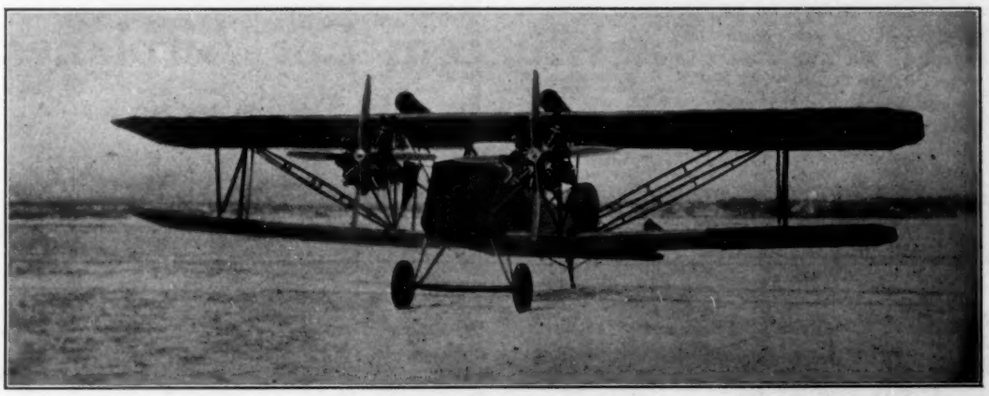

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